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The U.S. Milling and Baking Industries

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Abstract

U.S. per capita flour consumption reached 128 pounds in 1987, the highest mark since the early 1950's and 4 pounds over the 1986 level. This strong demand has been accompanied in the milling and baking industries by larger output per plant, improved production and distribution efficiency, and rising concentration (a relatively large share of capacity held by relatively fewer firms). Concentration among the top four wheat flour and durum milling firms alone increased from 34 percent in 1973 to 52 percent in 1987. This report, which describes the industries' structure, conduct, and performance, examines such current trends.

Keywords: Milling, baking, wheat marketing, flour, structure, conduct, performance.

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Conversion Chart

1 bushel of wheat = 60 pounds

1 metric ton (mt) = 2,204.622 pounds

1 short ton = 2,000 pounds

1 bushel of wheat = 43.8 pounds of flour at a 73-percent extraction rate

100 pounds of flour = 2.28 bushels of wheat at a 73-percent extraction rate

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Summary

U.S. per capita flour consumption reached 128 pounds in 1987, the highest mark since the early 1950's and 4 pounds over the 1986 level. This strong demand has been accompanied in the milling and baking industries by larger output per plant, improved production and distribution efficiency, and rising concentration (a relatively large share of capacity held by relatively fewer firms). Concentration among the top four wheat flour and durum milling firms alone increased from 34 percent in 1973 to 52 percent in 1987.

This report describes current trends in the structure, conduct, and performance of the U.S. milling and baking industries. It finds that:

- The rise in per capita flour consumption, from 117 pounds in 1980 to 128 pounds in 1987, contrasts sharply with the declining intake of the 1960's and early 1970's. It is one of the first reversals in flour consumption in the developed world.
- In 1987, 211 wheat flour and 18 durum mills produced U.S. flour and other wheat products. Capacities per plant are typically rising in the larger mills. Small mills are closing or filling special market niches.
- Concentration in flour milling increased substantially, with the top 12 firms controlling almost 84 percent of capacity in 1987, up from 68 percent in 1973. One firm held over 21 percent of U.S. capacity in 1988. Acquisitions and mergers are common in both the flour milling and baking industries.
- Wholesale baking plants are more numerous than milling plants because of greater product perishability. About 2,700 wholesale baking plants operated in the United States in 1982, over 10 times the number of milling plants. Many baking plants employ fewer than 20 workers. A few baking companies, however, have become quite large.
- Instore bakeries and specialty retail outlets are challenging traditional wholesale bakers who sell their packaged products through supermarkets and grocery stores. The number of instore bakeries jumped by 37 percent between 1982 and 1987.
- Many wholesalers are investing in promotional activities to develop greater consumer loyalty and to increase their competitiveness with each other and with instore bakeries. Wholesalers introduced more than 550 new bakery products in 1986, mainly to attract and hold consumers.

The U.S. Milling and Baking Industries

Joy L. Harwood, Mack N. Leath, and Walter G. Heid, Jr.*

Introduction

The structures of both the milling and baking industries are quite different than they were 20 years ago. In the 1970's and 1980's, conglomerate firms with substantial agricultural holdings acquired many of the large milling and baking companies. These large companies are now using their substantial financial resources and marketing finesse to improve plant efficiency. They are expanding plant sizes, emphasizing automation, purchasing more modern equipment, and expanding capacity use. Because these large firms often have lower costs and considerable marketing expertise, they have forced many small operations to either sell out or close their doors.

These changes in industry structure have also affected firm conduct and performance. Many of the large firms are continuing their acquisition activity and are further investing in equipment and plant expansions. Many firms are also increasing their capacity use. Although price competition and productive efficiency remain important, companies are increasingly focusing on marketing specialized products to particular market niches to enhance their profits.

This report examines the structure, conduct, and performance of the U.S. milling and baking industries in the 1980's. The report addresses changes in plant numbers, capacities, concentration ratios, margins, and buying and selling practices. With the increase in per-capita flour consumption and the growing output of these industries, an understanding of their economic structure and performance is necessary.

Wheat and wheat flour are the primary inputs used by the milling and baking industries. U.S. wheat millers ground wheat into over \$3 billion worth of flour in 1986. Wholesale bakers then used some of this wheat flour to produce nearly \$19 billion in bakery products (app. table 1).¹ Grain mill products accounted for 11 percent of the total value of food and kindred product shipments in 1986; the narrower flour

mill products category accounted for about 2 percent. Bakery products accounted for 6 percent of the total.

Domestic food use accounted for about two-thirds of total U.S. wheat disappearance in the mid-1980's and about one-fifth of total U.S. wheat supply. Domestic disappearance of wheat flour has grown steadily since the 1970 marketing year, increasing by about 37 percent between 1970 and 1987.

Several factors account for the steady upward trend in the food intake of wheat, which is typically consumed as flour. Americans are becoming more health conscious, reducing their fat intake and increasing their consumption of high-fiber, wheat-based products (71, pp. 48-49).² At the same time, Americans are purchasing more highly processed convenience foods, which often contain substantial amounts of flour (64, pp. 40-45).

Wheat flour is the primary grain product consumed in the United States, accounting for over 80 percent of per-capita disappearance. Only 15 percent of this total is sold directly to consumers as packaged family flour and bakery mixes (64, p. 40). The remaining 85 percent is processed into bakery items, such as breads, cakes, cookies, and pastas. Flour is also used in substantial quantities in the production of pastas, breakfast cereals, soups, gravies, and a variety of other prepared foods (22, p. 6).

The Flour Milling Industry

Flour millers grind and sift wheat into flour and millfeeds. For thousands of years, the goal of milling has been the separation of the outer bran and germ from the inner, more digestible endosperm. The outer kernel portions are typically used as millfeeds for livestock, while the endosperm is processed into flour.

Industry Setting

Flour millers are the major U.S. processors of wheat, accounting for over 90 percent of primary domestic wheat processing use. Other major wheat processors include breakfast food, pet food, and other feed manufacturers (table 1).

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¹ Other primary flour-using industries include blended and prepared flour, feed manufacturing, breakfast cereals, frozen specialties, and macaroni and spaghetti (see "The Baking Industry" section).

² Italicized numbers in parentheses refer to literature cited in the References section at the end of this report.

Millers process different wheat classes. Bakers then use the various types of flour produced. Bakers are the primary users of flour.

Hard red winter and hard red spring wheats are used mainly in the production of breads and rolls and, to a lesser extent, in the production of sweet goods and all-purpose flour. Soft red winter wheats are used in the production of sweet goods, cakes, cookies, crackers, and prepared mixes. White wheats, which can be either soft or hard, are used mainly in oriental noodles and pastry flours. Some wheats are used primarily for foods other than bakery items. Durum wheat, for instance, is used chiefly in the production of pastas. Depending on relative prices and protein levels, bakers often substitute flours made from different wheats in the production process.

Wheats are grown in different areas depending on their rainfall, temperature, and soil requirements (fig. 1). The hard wheats are produced mainly in the Great Plains States of Kansas, North Dakota, Oklahoma, and Montana. Soft red winter wheats are grown in wide-ranging areas east of the Mississippi River, while durum wheat is produced primarily in the Northern Plains and under irrigation in Arizona and California. White wheats are grown primarily in the Pacific Northwest, Michigan, and New York.

The location of wheat production by class has historically depended on agronomic tradition and breeding programs, although the situation has been slowly changing. Breeding specialists in North Dakota, for instance, have not traditionally released hard red winter wheat varieties but are now beginning to do so.

Millers of these different types of wheats are scattered across the United States. Most plants specialize in the milling of



Wheat, the staff of life, is converted into flour during milling. U.S. wheat millers ground wheat into over \$3 billion worth of flour in 1986.

either hard or soft wheats (132, pp. 11-40). Multiple-plant companies often own different types of mills, with large companies sometimes holding soft-wheat flour milling, hard-wheat flour milling, and durum milling plants.

The amount of wheat processed domestically by millers into flour and millfeeds has increased substantially over time. Wheat grind rose from 583 million bushels in marketing year 1960 to 760 million bushels in marketing year 1987, an increase of about 30 percent (table 2). The production of both flour and millfeeds (at 338 million hundredweight (cwt) and 6.1 million tons, respectively) reached record levels in 1987.

The levels of flour and flour product imports have risen along with the growth in wheat grind, rising by about 183 percent between 1980 and 1987. The growth in flour product imports (macaroni, vermicelli, egg noodles, and other pastas) has greatly overshadowed flour imports in recent years. Flour products currently account for about 90 percent of all flour and product imports. The United States imported 37 percent of its flour products from Canada in 1987, 29 percent from Germany, and 28 percent from Thailand. Flour imports are drawn primarily from Canada, France, and Japan (162).

Approximately 211 establishments milled hard, soft, and whole wheat flours in the United States in 1987, and 18 establishments milled durum wheat for semolina and durum flour (table 3). These wheat flour and durum mills reported total active daily capacity of 1,217,276 cwt, an increase of 22 percent from the 1973 level of 997,107 cwt (132, p. 11; 137, p. 16). The bulk of flour milling capacity is located near Buffalo, NY; Minneapolis, MN; and Kansas City, MO; although flour mills are scattered across the United States (132, pp. 11-40).

The operating and ownership structures of these companies can vary substantially. Some milling companies remain single-unit enterprises, while others form part of a highly in-

Table 1—Wheat use by primary U.S. wheat processing industries, 1982

Industry	SIC code ¹	Wheat use 1,000 bushels
Flour and other grain mill products	2041	652,200
Cereal breakfast foods	2043	11,800
Feed manufacturing:		
Dog, cat, and other pet foods	2047	14,083
Other prepared feeds	2048	36,833
Four-industry total	—	714,916

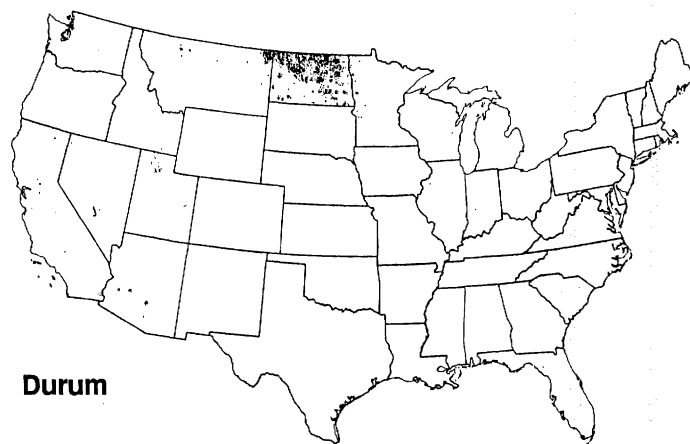
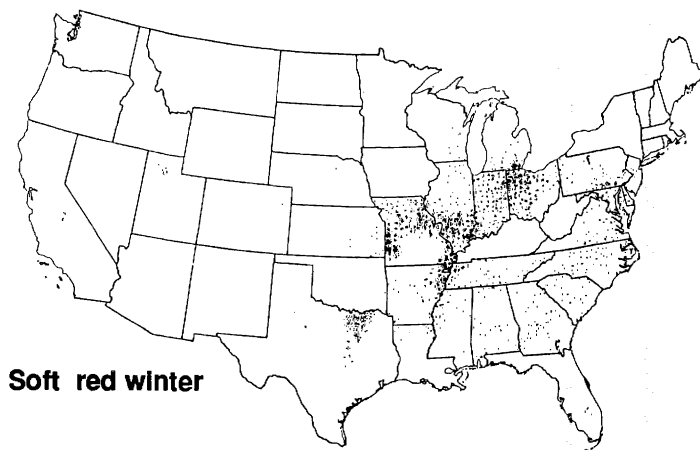
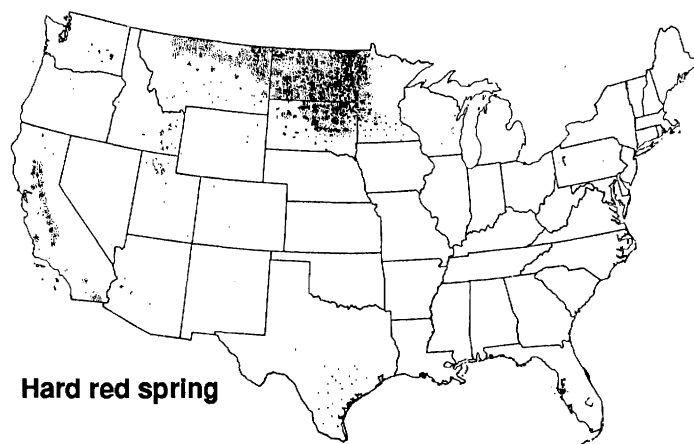
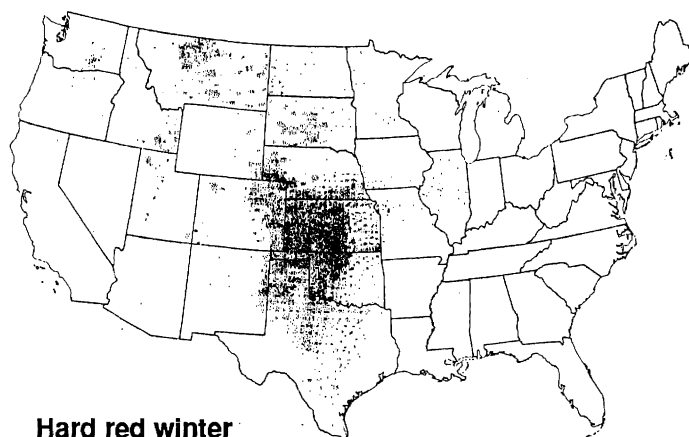
— = Not applicable.

¹ SIC codes are designations under the Standard Industrial Classification system.

Source: (177, pp. 20D-31, 32).

Figure 1

Distribution of the five U.S. market classes of wheat



1 Dot = 5,000 acres
Source (9).

tegrated, multiple-unit company structure. Milling companies generally have been classified into four major categories (21, p. 7):

- Multiunit flour millers that are diversified into other processing and commodity operations (Cargill, ADM, and ConAgra);
- Vertically integrated food processors that balance production with outside purchases and compete with one another in branded, private label, and generic product areas (Pillsbury, General Mills, and Nabisco);
- Millers that are primarily flour producers with regional markets (Fisher Mills, Dixie Portland, and Mennel); and
- Small millers with a single establishment, or a few mills that serve local markets or special product niches (Roman Meal).

Individual flour mills often grind only one wheat class. Hard wheat mills, which produce bread flours, are the most abundant in number and accounted for about 70 percent of total U.S. hard, soft, whole wheat, and durum capacity in 1987 (app. tables 2 and 3). Soft wheat mills, which produce cake, cookie, and pastry flours, accounted for 20 percent of total 1987 U.S. wheat milling capacity. Durum wheat mills, which produce semolina for pasta products, and whole wheat mills respectively accounted for 8 and 2 percent of total U.S. wheat milling capacity.

Soft wheat milling is technologically different from hard wheat milling. Soft wheats typically require less tempering and more sieve surface than hard wheats. Air classification



The baking industry now uses 85 percent of U.S.-milled wheat flour to make bakery items such as breads, rolls, cakes, and cookies, and prepared foods such as breakfast foods, pasta, and soups.

(see glossary) is more often used for hard wheats than for soft wheats (24).

Although most milling plants grind only one wheat class, some plants have alternating capacities that allow the milling of two or more wheat classes. Plants that can grind more than one class of wheat can more fully use their available capacity because they can more readily respond to changes in demands for different flour types (24).

Trends in Consumption and Supply

The U.S. flour milling industry has changed substantially in the past 15 years. Domestic per-capita consumption of wheat flour grew by about 15 percent between 1970 and 1987 (see "Domestic Consumption of Flour" section). Millfeed use in the 1980's has increased. The Export Enhancement Program has helped maintain the U.S. share of the world flour trade. Together, these factors have encouraged widespread expansion in mill capacities and industry output.

Domestic Consumption of Flour

Domestic flour disappearance has grown substantially in the 1980's. Disappearance in 1987, at a record high of over 312 million cwt, had risen by nearly 23 percent above its 1977 level and by almost 50 percent since 1960 (table 4). Domestic disappearance increased for the 10th consecutive year in 1987. During the 1980's, disappearance has increased, on average, by about 2 percent each year.

This growth in domestic disappearance is reflected in an increase in per-capita disappearance, a trend that began in the mid-1970's (table 4). Per-capita flour consumption was 128 pounds in 1987, which was the highest since the early 1950's and 4 pounds over the 1986 record (64, p. 40; 158). This phenomenon is a sharp contrast to the declining flour consumption levels recorded in the 1960's and early 1970's and marks one of the first flour consumption reversals in the developed world (62, p. 56).

Growing health concerns have contributed to the dramatic increase in per-capita consumption. Nearly two-thirds of the respondents to a survey conducted by the U.S. Department of Agriculture (USDA) and the Food and Drug Administration (FDA), an agency of the U.S. Department of Health and Human Services, for example, reported that they had changed their diets in 1985 and 1986 for health reasons. Consumers increasingly recognize fiber, bran, and whole grains as cancer preventatives (71, p. 48). These responses indicate that consumers are following recommendations from the American Heart Association and the National Cancer Institute, which have encouraged reduced fat consumption and increased intake of the complex carbohydrates found in grain products (75, p. 20). Greater grain con-

Table 2—U.S. wheat grind: Supply and use

Year	Wheat grind	Millfeed production	Flour production	Flour and product imports	Total supply ¹	Exports	Domestic use
	<i>1,000 bushels</i>	<i>1,000 tons</i>			<i>1,000 cwt</i>		
1960	582,719	4,827	255,596	141	255,737	42,193	213,544
1965	564,724	4,645	250,591	145	250,736	30,791	219,945
1970	563,714	4,409	253,094	325	253,419	26,068	227,351
1971	555,092	4,279	249,810	341	250,151	20,700	229,451
1972	557,801	4,303	250,441	477	250,918	20,354	230,564
1973	567,287	4,395	254,661	550	255,211	16,133	239,078
1974	562,962	4,483	251,097	665	251,762	14,486	237,276
1975	582,675	4,701	258,985	621	259,606	12,386	247,220
1976	618,284	4,920	275,077	604	275,681	16,108	259,573
1977	618,125	4,787	275,784	604	276,388	22,090	254,298
1978	621,321	4,860	277,950	773	278,723	22,213	256,510
1979	636,375	4,945	284,051	823	284,874	21,013	263,861
1980	628,559	4,866	282,655	904	283,559	17,432	266,127
1981	634,381	5,045	283,966	1,166	285,132	18,739	266,393
1982	653,206	5,228	290,907	1,496	292,403	21,080	271,323
1983	689,951	5,655	311,587	1,590	313,177	37,465	275,712
1984	674,665	5,426	299,832	2,005	301,837	21,912	279,925
1985	700,151	5,556	313,815	2,064	315,879	20,907	294,972
1986	737,537	5,799	326,316	2,179	328,495	29,858	298,637
1987	760,459	6,135	338,484	2,562	341,046	28,710	312,194

¹ Total supply equals total disappearance.

Source: (158).

sumption particularly benefits those involved in the production of wheat products; wheat flour accounts for about 80 percent of total U.S. grain intake (app. table 4; 64, p. 40).

Other factors have contributed to the large growth in per-capita flour consumption. Individuals who are less health conscious are eating more flour-based desserts and sweet goods. In addition, many manufacturers introduced wheat-based products in response to consumers' increasing desire for greater food variety in the late 1970's and early 1980's (75, p. 20). Partly because of these efforts, food products that were once only in the "specialty" category, such as bagels, English muffins, and pita bread, are growing in popularity (39, pp. 19-22).

At the same time, grocery stores are focusing on instore bakery sales, and retail shops are emphasizing specialty baked goods (T.J. Cinnamon's, Vie de France) and cookies (Mrs. Field's, Famous Amos). The boom in away-from-home eating has especially spurred the increase in per-capita wheat consumption (86, p. 7). Consumers are eating more fast foods (which are often delivered in buns), pizzas, frozen meals in flour-based sauces, tortillas, and other specialty items.

The growth in per-capita flour consumption is primarily reflected in the greater domestic shipments, by quantity, of

bread- and soft-type flours, certain family flours, flours milled for food use by blenders and processors, and certain flours other than white flour (table 5). Between 1972 and 1982, shipments of bread-type flour increased by 18 percent. Over the same period, soft-type flour shipments for use in pastries and other sweet goods increased by 21 percent. Shipments of certain specialty flours (whole wheat for use in bread and durum for use in pasta) have also been rising. Shipments of family flour ("all other" types) increased between 1972 and 1982, most likely in response to growing demand from institutional buyers.

The value of wheat-based product shipments accounted for about 86 percent of the value of all grain mill product shipments in 1982 (table 6). For example, the market share held by flour mixes and refrigerated doughs, one of the fastest growing segments of the grain mill industry, increased from 26 percent in 1972 to 32 percent in 1982. The share held by shipments of wheat flour declined and then rebounded, from 54 percent in 1972 to 45 percent in 1977, and up again to 47 percent in 1982. Shipments of other grain mill products remain a relatively small portion of total shipments.

Flour Exports

U.S. flour exports, although a relatively small fraction of total disappearance, have at times been an important source

Table 3—Number of wheat flour and durum mills by daily capacity, 1987

Daily capacity	Wheat flour ¹	Durum
	<i>Number</i>	
Under 200 cwt	21	0
200–399 cwt	22	0
400–999 cwt	17	1
1,000–4,999 cwt	61	4
5,000–9,999 cwt	48	11
10,000 cwt and over	42	2
Total	211	18

¹ Includes hard, soft, and whole wheat flour mills.

Source: (132, pp. 1, 60).

Table 4—Domestic and per-capita disappearance of wheat flour

Year	Total domestic disappearance	Population, July 1	Per-capita disappearance
	<i>1,000 cwt</i>	<i>Millions</i>	<i>Pounds</i>
1960	213,544	180.7	118
1961	217,270	183.7	118
1962	214,794	186.5	115
1963	215,910	189.2	114
1964	219,963	191.8	115
1965	219,945	194.2	113
1966	220,086	196.5	112
1967	224,540	198.6	113
1968	226,341	200.6	113
1969	227,977	202.6	113
1970	227,351	205.1	111
1971	229,451	207.7	110
1972	230,564	209.9	110
1973	239,078	211.9	113
1974	237,276	213.9	111
1975	247,220	216.0	114
1976	259,573	218.0	119
1977	254,298	220.2	115
1978	256,510	222.6	115
1979	263,861	225.1	117
1980	266,127	227.7	117
1981	266,393	229.8	116
1982	271,323	232.1	117
1983	275,712	234.3	118
1984	279,925	236.7	118
1985	294,972	239.3	123
1986	298,637	241.5	124
1987	312,194	243.7	128

Source: (158).

of revenue for millers. Flour exports averaged about 8 percent of total disappearance between 1980 and 1987, reaching a maximum 12 percent of disappearance in 1983 (see table 2). Flour exports help millers maintain their level of grind and allow them to achieve profit levels that would otherwise be difficult (60, p. 28).

Government programs play a critical role in boosting flour exports (table 7). During the 1980's, the primary Government programs included Public Law (P.L.) 480, Commodity Credit Corporation (CCC) export credit programs, and the Export Enhancement Program (EEP). These programs have been instrumental in moving from 50 percent to over 90 percent of all flour exports since 1977.

The P.L. 480 program has historically been the most important program for the export of U.S. flour. P.L. 480 authorizes food aid distribution and long-term concessional credit at low interest rates (127, p. 27). P.L. 480 goals are to expand international trade, to develop and expand U.S. export markets, to combat hunger and malnutrition, to encourage economic development in developing countries, and to promote U.S. foreign policy (126, p. 2). From 40 to 90 percent of flour exports has moved under the P.L. 480 program in the 1980's.

Two CCC export credit programs, which guarantee repayment of private short- and intermediate-term commercial credit (GSM-102 and GSM-103), also facilitate U.S. flour exports. The Export Credit Guarantee Program (GSM-102) has guaranteed repayment of private, short-term credit (up to 3 years) since 1981. The Intermediate Credit Guarantee Program (GSM-103) is similar to GSM-102 in many respects but covers credit extended for 3-10 years (127, p. 26). The GSM-102 and GSM-103 programs significantly facilitated flour exports in 1983 and 1986 (table 7).

The EEP, initiated in 1985, appears particularly important in supporting the level of flour exports in the late 1980's. The EEP generally operates by way of a two-step, competitive bid process to help U.S. exporters compete, while minimizing bonuses awarded from CCC stocks. Initially, the CCC targets a country for a specific quantity of a commodity. Then U.S. exporters compete for sales to the targeted market. Knowing they might have the opportunity to obtain a CCC bonus enables U.S. exporters to offer competitive prices to that market (127, p. 26).

Having made sales contingent on receiving a CCC bonus, the U.S. exporters then bid against each other for the bonus. The CCC evaluates both the sales price to the foreign purchaser and the bids for the bonuses. The bonuses are awarded to the exporter(s) whose sales price and bonus offer fall within an acceptable range (127, p. 26).

The selected exporter(s) then completes the sale, presents proof of arrival of the commodities at their destination, and receives the CCC bonus in terms of generic certificates exchangeable for CCC commodities. The exporter may either sell the generic certificates or exchange them for CCC stocks (127, p. 26). An export shipment moving under the EEP may also qualify for commercial credit (GSM-102 and GSM-103). The United States sold about 700,000 metric tons of

flour under the EEP in fiscal years 1985 and 1986, but only 322,000 metric tons in 1987 (144).

The EEP, in particular, aims to offset the effects of sizable European Community (EC) subsidies. Without the EEP, U.S. shipments to targeted markets in fiscal year 1986 would have likely remained at the 1984-85 level or lower, and shipments by the EC would have been much larger (107, pp. 84-85; 126, p. 5). Despite U.S. efforts, the EC remains by far the world's largest flour exporter (table 8).

Intercountry competition for flour sales has intensified during the 1980's with the construction of mills in developing countries and the resulting decline in world flour trade. The world flour trade declined at a nearly steady pace from a recent high of 8.7 million metric tons in 1980/81 to 5.7 million metric tons in 1985/86, the lowest level in 10 years (26, p. 1:3; 27, p. 1:2; 60, p. 28). This situation made the increase in U.S. flour exports in 1986 a surprise (110, p. 43).

Escalating subsidies, designed to expand individual-country market shares, have sent world flour prices tumbling. In July 1985, immediately after introduction of the EEP, the world flour price was \$171 per metric ton. By July 1986, EC flour prices had fallen to \$146 per metric ton and had dropped to \$100 per metric ton by February 1987. World

flour prices remained near \$100 per metric ton between 1987 and mid-1988 (135, p. 32). The "subsidy war" has led to bitter confrontations, most recently from the Canadians, who complained of unfair trade practices in the April 1988 EC sale to Cuba.³

The P.L. 480, export credit, and Export Enhancement Programs have been important political tools for the U.S. Government. Egypt, of strategic importance, received about two-thirds of all P.L. 480 shipments in fiscal years 1984, 1985, and 1986 (table 9). Egypt also received about one-half of all EEP sales and three-fourths of all commercial credit sales in 1986. Other major recipients of program benefits include Ethiopia, Iraq, Sudan, Yemen, and Zaire.

Flour Supply

Growth in the domestic flour market has spurred increases in flour production. Production in 1987 reached 338 million cwt, up by about 4 percent from the previous year's record (see table 2). Wheat product imports have nearly tripled

³ Canada traditionally has supplied all of Cuba's flour needs. In April 1988, however, West Germany sold Cuba 80,000 tons of flour, likely cutting Canada's export market for flour by 25 percent. To complete the sale, the EC export subsidy equaled \$195 per metric ton, which, according to the Canadian Wheat Board, was more than twice the initial price paid to Canadian farmers for wheat (135, p. 32).

Table 5—Quantity and value of shipments of wheat flour, excluding flour mixes

Product	Quantity			Value		
	1972	1977	1982	1972	1977	1982
	----- 1,000 cwt -----			----- Million dollars -----		
White flour:						
Export shipments—						
Commercial dollar exports	15,180	11,964	4,327	91	90	44
All other ¹	6,873	7,581	9,191	46	52	94
Domestic shipments—						
Bakers' and institutional bread-type	118,710	145,782	139,935	718	1,111	1,471
Bakers' and institutional soft-type	47,814	43,598	57,914	270	294	555
Self-rising family flour	5,895	6,386	4,884	58	74	85
All other family flour ²	19,812	19,747	23,380	178	194	360
Shipments to blenders and processors— ³						
For use in food products	11,220	11,999	17,619	67	87	163
For use in nonfood products	2,494	3,754	3,550	12	21	26
Other than white flour:						
Whole wheat	1,615	2,809	2,466	10	25	28
Durum flour and semolina	15,670	18,360	17,676	100	145	193
Bulgur	— ⁴	6,892	5,171	— ⁴	51	49
Other wheat flour	6,018	3,262	1,489	77	65	34
Nonspecified wheat flour	288	—	—	—	—	—
Total shipments	251,589	⁵	⁵	1,627	2,209	3,102

— = Not available in 1977 and 1982.

¹ Includes P.L. 480 shipments.

² Includes phosphated, plain, bromated, enriched, and all-purpose flour.

³ For further processing and/or packaging before resale or shipment.

⁴ Included with "other wheat flour."

⁵ Total wheat flour shipments are not reported in the Census in 1977 and 1982 to avoid disclosing shipments by individual operations.

Sources: (177, p. 20D-21; 178, p. 20D-21; 179, p. 20D-22).

since 1980. Because of these influences, flour supply has increased nearly every year since 1974, except 1980 and 1984.

Structure of the Flour Milling Industry

Scale economies in processing, procurement, finance, and transportation have influenced the structure of the milling industry. Such economies appear largely responsible for the

drop in mill numbers and the dramatic increase in average milling capacities per plant. These economies, plus flour consumption growth, partly account for the large number of milling acquisitions by diversified, multinational food firms.

Mill Numbers

U.S. flour mills have been dropping in number, reflecting a long-term trend toward consolidated production. The total

Table 6—Relative importance of primary flour and grain mill product groups based on shipment value

Product group	1972		1977		1982	
	Shipment value	Share	Shipment value	Share	Shipment value	Share
	<i>Million dollars</i>	<i>Percent</i>	<i>Million dollars</i>	<i>Percent</i>	<i>Million dollars</i>	<i>Percent</i>
Wheat flour, excluding flour mixes	1,627	53.7	2,209	45.2	3,102	47.3
Wheat mill products other than flour ¹	223	7.4	455	9.3	479	7.3
Corn mill products ²	242	8.0	413	8.5	554	8.4
Other grain mill products ³	45	1.5	98	2.0	166	2.5
Flour mixes and refrigerated doughs ⁴	796	26.3	1,492	30.6	2,074	31.6
Products not specified	94	3.1	216	4.4	189	2.9
Total	3,027	100.0	4,883	100.0	6,564	100.0

¹ Includes wheat millfeed, wheat germ, and other wheat mill products.

² Includes food products, feed byproducts, and other corn mill products.

³ Includes oat, rye, and buckwheat products.

⁴ Includes shipments by the blended and prepared flour industry (1982 product code 2045).

Sources: (177, pp. 20D-18-21; 178, p. 20D-20; 179, pp. 20D-18, 19).

Table 7—Wheat flour exports by U.S. Government program¹

Fiscal year ²	Government programs				Total exports ⁵
	P.L. 480	Export credit programs ³	Export Enhancement Program ⁴	Total Government programs	
1,000 metric tons					
1977	642	—	—	642	1,307
1978	724	—	—	724	1,395
1979	643	—	—	643	1,195
1980	601	25	—	626	882
1981	660	37	—	697	949
1982	648	9	—	657	717
1983	589	941	—	1,530	1,529
1984	747	155	175	1,077	1,071
1985	616	0	703	1,319	718
1986	598	379	668	1,645	1,094

— = No shipments.

¹ Government program totals may exceed export totals because of two factors. First, Government program totals include any overlap between export credit programs and the Export Enhancement Program. Second, P.L. 480 and export credit program data reflect year of shipment; Export Enhancement Program data reflect year of sale. Total exports reflect the year of shipment.

² October 1–September 30.

³ GSM-101, GSM-102, GSM-103, and blended credit programs.

⁴ The export enhancement program was initiated in 1985.

⁵ Government program and commercial exports combined.

Sources: (144; 148; 149; 160).

Table 8—Wheat flour exports

Country/region	1980 ¹	1982	1984	1986
<i>1,000 metric tons</i>				
Australia	137	124	81	82
Canada	638	401	428	481
European Community ²	4,891 ³	3,689 ⁴	4,032 ⁴	3,516 ⁵
United States ⁶	1,390	1,590	1,003	1,704
Soviet Union	200	200	200	250
Japan ⁷	100 ⁸	149	210	431
Others	1,340 ⁹	676 ¹⁰	283 ¹⁰	285
World total	8,696	6,829	6,237	6,749

¹ July 1–June 30.

² Excludes intra-EC trade. Includes secondary trade (flour processed from imported wheat).

³ Nine member States (excluding Greece).

⁴ Ten member States (excluding Portugal and Spain).

⁵ Twelve member States.

⁶ Data series revised to exclude certain wheat products.

⁷ Secondary trade (flour processed from imported wheat).

⁸ International Wheat Council estimate.

⁹ Includes 683,000 tons from Greece.

¹⁰ Includes Spain.

Sources: (25, p. 1:2; 26, p. 1:3).

number of plants milling hard-, soft-, and whole-wheat flour fell from 279 in 1973 to 211 in 1987, a decline of about 24 percent (table 10). Durum mill numbers, in contrast, climbed from 13 to 18 plants over the same period. This increase was likely prompted by the jump in pasta consumption in the early 1980's.

The closing of small hard-, soft-, and whole-wheat flour mills has offset the escalating number of large-capacity mills and the growth in durum mills of all sizes. Mill numbers are expanding only for hard-, soft-, and whole-wheat flour mills with at least 10,000 cwt of daily capacity (table 10). Mill numbers in this category rose from 24 in 1973 to 42 in 1987, an increase of 75 percent. Small wheat flour mills (less than 1,000 cwt) are frequently shutting down (106, pp. 20-21). Those that remain in business are often carving out niches in specialty markets. Durum mill numbers, in contrast, are climbing (105, p. 7).

Changes in market focus partly account for the different trends in wheat flour and durum mill numbers. Hard- and soft-wheat mills often emphasize the long production runs associated with selling large quantities and reducing per-unit costs. Durum plants are frequently more varied in nature. Some are dedicated to company pasta plants, others are large volume operations, and some focus on sales to specialty pasta producers.

Mill Capacities

An increase in total U.S. mill capacity has accompanied the drop in plant numbers (table 11). Total capacity rose from 997,107 cwt per day in 1973 to 1,217,276 cwt in 1987, an

Table 9—The largest U.S. Government program recipients of flour by program¹

Program/country	1984 ²	1985	1986
<i>1,000 metric tons</i>			
P.L. 480:			
Bolivia	11.1	8.8	21.9
Egypt	504.5	401.8	389.9
Ethiopia	0	11.7	28.4
Morocco	30.4	18.6	18.7
Peru	24.5	11.5	15.0
Poland	41.3	37.3	0
Somalia	18.8	17.6	22.2
Sudan	67.8	68.4	74.3
Total	698.4	575.7	570.4
All countries	746.8	616.0	597.7
Export credit programs: ³			
Egypt	128.0	0	301.0
Iraq	0	0	78.0
Jamaica	27.0	4	0
Total	155.0	0	379.0
All countries	155.0	0	379.0
Export Enhancement Program:			
Egypt	175.0	425.0	368.0
Iraq	—	100.0	125.0
Philippines	—	50.0	—
Yemen	—	64.0	139.0
Zaire	—	64.0	30.0
Zanzibar	—	—	6.0
Total	175.0	703.0	668.0
All countries	175.0	703.0	668.0

— = No shipment.

¹ P.L. 480 and export credit program data reflect year of shipment; Export Enhancement Program data reflect year of sale.

² October 1–September 30.

³ The only export credit program shipments in 1984–86 were under the GSM-102 and GSM-103 programs.

⁴ Negligible.

Sources: (144; 149; 160).

increase of 22 percent. The share of total flour-milling capacity held by durum mills has been increasing. Companies are in particular expanding those plants among hard-, soft-, and whole-wheat flour mills with 10,000 or more cwt of daily productive capacity. These large mills provided about 55 percent of daily 1987 wheat flour capacity, a substantial increase from a 36-percent share in 1973 (table 11).

As the number of U.S. flour mills grinding hard-, soft-, and whole-wheat flours has declined, average mill capacities have increased. The average capacity at these mills in 1987 reached 5,311 cwt, up nearly 60 percent from 3,330 cwt in 1973 (table 12). In contrast, the capacities of durum mills have risen only slightly. The average capacity of durum mills was 5,363 cwt in 1987, up marginally from the 5,231 cwt of capacity held in 1973. Mills need not expand their physical facilities to expand their capacity. Rather, they can increase their productive capacity by purchasing new equipment that improves their existing capacity use (24).

Two factors primarily account for the overall increase in U.S. productive capacity and the increase in average capacity per plant. U.S. flour disappearance increased by about 37 percent between 1970 and 1987 (see table 4). Much of this increase has occurred since 1984. Substantial increases in per-capita consumption have interested millers in using their capacities more efficiently. In addition, economies of scale favor larger capacity plants. Millers indicate that, within limits, plant capacity can be enlarged at a

Table 10—Number of wheat flour and durum mills by mill size

Daily capacity	1973	1978	1983	1987
<i>Number</i>				
Wheat flour mills: ¹				
Under 200 cwt	54	46	34	21
200–399 cwt	35	34	30	22
400–999 cwt	36	26	20	17
1,000–4,999 cwt	78	67	63	61
5,000–9,999 cwt	52	57	51	48
10,000 cwt and over	24	31	39	42
Total	279	261	237	211
Durum mills:				
Under 200 cwt	0	0	0	0
200–399 cwt	0	0	0	0
400–999 cwt	0	0	0	1
1,000–4,999 cwt	4	4	4	4
5,000–9,999 cwt	8	7	7	11
10,000 cwt and over	1	2	3	2
Total	13	13	14 ²	18

¹ Includes hard-, soft-, and whole-wheat flour mills.

² Does not include 1 Oregon mill with alternating wheat flour capacity.

Sources: (I32, pp. 11, 60; I33, pp. 9, 60; I34, pp. 14, 69; I37, pp. 16, 99–100).

less-than-proportionate increase in energy and equipment costs.⁴ Per-unit labor costs can drop sharply with larger output because the operating crew of a larger plant is comparable to that of a smaller plant.

Industrial organization theory indicates several other factors that favor large-capacity plants. Although supporting data in the milling industry is not available, industry sources indicate that these economies can at times be quite important. The theory indicates, for instance, that unit transportation costs can fall if larger mills can negotiate lower rail rates than their smaller counterparts. In addition, larger plants may have better access to information and credit than smaller plants, particularly if they are part of a larger corporate structure (I21, pp. 81–84).

Though mill capacities have grown, the market share (measured by value of shipments) of milling establishments with 50 or more employees has shrunk over time. The share held by these firms dropped from 79 percent in 1972 to 75 percent in 1982, while the share held by establishments with 49 or fewer employees expanded from 21 percent to 25 percent over the same period (table 13).⁵ Because mill capacities can often increase without additional labor, many large-capacity mills will likely continue to have fewer than 50 employees.

⁴ One milling company executive recently observed that the original plan for a new mill called for 3,000 cwt of productive capacity—until it was discovered that an extra 2,000 cwt could be added at nominal cost (94).

⁵ The number of establishments reported in table 13 (compiled by the Bureau of the Census) does not match those reported by *Milling and Baking News* (the source for mill numbers cited previously). The census data include not only flour mills, but dry corn mills and plants processing buckwheat, oats, and rye.

Table 11—Capacity of wheat flour and durum mills by mill size

Daily capacity	1973	1978	1983	1987
<i>Cwt</i>				
Wheat flour mills: ¹				
Under 200 cwt	5,845	4,950	3,856	2,371
200–399 cwt	9,469	9,555	8,425	6,415
400–999 cwt	20,093	15,845	11,995	10,330
1,000–4,999 cwt	197,750	169,620	164,770	168,670
5,000–9,999 cwt	361,850	386,650	350,616	317,200
10,000 cwt and over	334,100	440,340	552,144	615,750
Total	929,107	1,026,960	1,091,806	1,120,736
Durum mills:				
Under 200 cwt	0	0	0	0
200–399 cwt	0	0	0	0
400–999 cwt	0	0	0	900
1,000–4,999 cwt	10,800	11,550	8,400	5,900
5,000–9,999 cwt	45,200	37,100	41,000	65,240
10,000 cwt and over	12,000	24,000	33,000	24,500
Total	68,000	72,650	82,400 ²	96,540 ²

¹ Includes hard-, soft-, and whole-wheat flour mills.

² Does not include capacity alternating with wheat flour.

Sources: (I32, pp. 11, 60; I33, pp. 9, 60; I34, pp. 14, 69; I37, pp. 16, 99–100).

Table 12—Capacity of wheat flour and durum mills by State

State/ commonwealth	1973		1987	
	Wheat flour ¹	Durum	Wheat flour ¹	Durum
	Cwt			
Alabama	7,300	0	9,000	0
Arizona	1,000	0	9,500	2,500
California	38,600	3,000	65,700	4,800 ²
Colorado	15,200	0	19,000	0
Delaware	472	0	472	0
District of Columbia	2,000	0	0	0
Florida	9,500	0	27,500	0
Georgia	5,950	0	13,100	0
Hawaii	2,200	0	2,200	0
Idaho	720	0	0	0
Illinois	53,360	0	65,060	0
Indiana	23,440	0	29,900	0
Iowa	18,100	0	14,750	0
Kansas	115,250	0	104,440	0
Kentucky	4,065	0	4,175	0
Louisiana	0	1,000	11,500	1,400
Maryland	400	0	3,000	0
Massachusetts	0	0	0	8,840
Michigan	20,600	0	27,200	0
Minnesota	75,260	29,400	103,610	27,000
Missouri	79,240	0	74,848	11,800
Montana	12,000	0	14,700	0
Nebraska	33,170	0	23,670	6,000
New Jersey	4,600	0	12,000	0
New Mexico	700	0	1,600	0
New York	86,600	10,600	109,900	5,600
North Carolina	19,730	0	33,110	0
North Dakota	5,000	5,000	7,000	13,000
Ohio	68,525	0	69,575	6,000
Oklahoma	22,200	0	29,500	0
Oregon	23,000	5,000	18,000	6,000 ²
Pennsylvania	33,881	5,000	40,610	0
Puerto Rico	6,000	0	0	0
South Carolina	3,800	0	1,600	0
South Dakota	3,000	0	3,000	0
Tennessee	33,860	0	45,960	0
Texas	27,040	0	44,060	0
Utah	27,720	0	35,100	8,100 ³
Virginia	17,874	0	17,596	0
Washington	27,750	0	28,800	0
Wisconsin	0	9,000	0	13,500
Total capacity	929,107	68,000	1,120,736 ⁴	96,540 ⁵
	Number			
Total mills	279	13	211	18
	Cwt			
Average capacity per mill	3,330	5,231	5,311	5,363

¹ Includes hard-, soft-, and whole-wheat flour mills.

² Total durum capacity alternates with other flour types.

³ 7,200 cwt of durum capacity alternates with other flour types.

⁴ Total includes capacity alternating with wheat flour.

⁵ Total does not include capacity alternating with wheat flour.

Sources: (I32, pp. 9, 11; I37, pp. 13, 16).

The productive capacities devoted to different types of wheat milling differ widely among States. The top-ranked States in daily hard-wheat flour capacities are New York, Kansas, and Minnesota. The largest soft-wheat capacities are found in Ohio, Illinois, Michigan, Tennessee, and Pennsylvania. Productive capacities devoted to whole-wheat flour milling are concentrated in Minnesota and Washington (app. table 3). Durum productive capacities are heavily concentrated in Minnesota but are also found in Wisconsin, North Dakota, and Missouri (app. table 2). Overall, States with the largest number of flour mills typically have the largest share of total U.S. milling capacity (I32, p. 9).

Mill Locations

The 211 U.S. wheat flour and 18 durum mills in 1987 were scattered across 38 States. States with the most active mills included Pennsylvania (21), Kansas (18), Minnesota (16), New York (12), and Ohio (12). Milling activity was particularly large in the areas surrounding Lancaster, PA, Minneapolis, MN, Kansas City, MO, and Buffalo, NY. According to *Milling and Baking News*, flour milling activity was almost nonexistent in Idaho, Wyoming, Nevada, Arkansas, Mississippi, and several other States (I32, p. 9).

Most companies which have built flour mills in the 1980's have located them near population centers. Mill locations largely depend on the expected costs of shipping flour relative to wheat at the time the mills are built (33). The costs of other factors have not varied much by location (see below).

Table 13—Number of establishments in the flour and other grain mill products industry, shipment value, and market share by plant size

Item and plant size	1972	1977	1982
Number			
Establishments:			
1-19 employees	276	234	186
20-49 employees	76	67	78
50-99 employees	60	59	49
100 employees or more	45	47	47
All establishments	457	407	360
Million dollars			
Shipment value:			
1-19 employees	122	228	277
20-49 employees	390	663	952
50-99 employees	712	987	1,227
100 employees or more	1,156	1,805	2,477
All establishments	2,380	3,683	4,933
Percent			
Market share: ¹			
1-19 employees	5	6	6
20-49 employees	16	18	19
50-99 employees	30	27	25
100 employees or more	49	49	50
All establishments	100	100	100

¹ Based on shipment value.

Sources: (I77, p. 20D-15; I78, p. 20D-16; I79, p. 20D-13).

Because major wheat- product-consuming areas are far from wheat-growing areas, rail rates are particularly important in determining mill location.

Until the 1950's, mills were typically built near wheat-growing areas because rail rates for shipping wheat and flour were about equal. Rates for flour began to rise relative to wheat rates in the early 1960's (24). Since then, companies often built their mills closer to population centers (see "New Plant Construction" section). Plant numbers fell in many Southern and Midwestern States between 1973 and 1987, whereas they rose or stayed constant in high-growth States (table 14). By the mid-1980's, certain rail rates for shipping flour from Kansas City to the East Coast were nearly double the rates for shipping wheat (24).

Little information exists explaining the changes in relative rail rates between flour and wheat. One of the most important factors, however, is likely the large volume of wheat moving by covered hopper cars (24). Hopper cars, a technology adopted in the early 1960's, reduced the costs of bulk wheat shipment. While flour can move in special hopper cars, bakers appear to frequently prefer smaller shipments.

Neither large nor small bakery operations want to incur the high inventory costs associated with storing large quantities of flour. In addition, many bakers do not need large shipments. Many bakers likely continue to receive flour by bags in boxcars or pneumatically by truck, and remain unable to take advantage of the quantity discounts accruing to large-scale wheat shipments by rail.

Other factors are also important in explaining the relative rise in flour rates. Boxcars often have higher loss and damage claims and loading and unloading costs than covered hopper cars (3, p. 62). In addition, sanitation requirements are higher for flour than for wheat (24).

Rail deregulation has had an uncertain effect on locational preference. One argument is that deregulation should increase the gap between wheat and flour rates because wheat increasingly moves under low unit-train rates, while flour continues to move primarily by truck and under single-car rail rates (3, p. 70). (Unit trains are trains in which each car is filled with the same commodity.) The differential has unexpectedly narrowed since passage of the Staggers Act, which launched deregulation (3, p. 70). This situation may arise from larger flour shipments, not deregulation. Confidential contract rates, now often used in flour milling, further cloud the issue (3, p. 70).

Factors other than shipping costs appear to be less important in determining mill location (3, p. 62). Wheat milling is not labor-intensive, for instance, and mill workers can be easily trained. The milling process is not energy-intensive so milling is not attracted to low-cost energy areas. Interest and tax costs are relatively small and display little spatial variation.

Acquisitions and Ownership Changes

The ownership of many flour milling companies has changed in the past 20 years. In the 1970's and 1980's, purchases by established milling firms have particularly affected industry structure (tables 15 and 16). Several of the largest companies have more than doubled their mill numbers and daily productive capacities. (See appendix tables 5 and 6 for more detailed information than discussed below.)

ADM Milling Company, for instance, expanded its ownership in 1983 to 17 mills and about 123,000 cwt of daily productive capacity, mainly through the purchase of three mills from Centennial (tables 15 and 16). ADM also bought all but one of Nabisco's mills in the mid-1980's. ADM's capacity increased from 79,500 cwt in 1973 to 167,700 cwt in 1987.

ConAgra similarly bought Peavey Company in 1983 and International Multifoods, Inc., in 1988. ConAgra's capacity increased from 88,300 cwt in 1973 to 191,500 cwt in 1987 and to 270,000 cwt in late 1988 (table 16; 131, p. 10). Peavey itself bought four mills from Colorado Milling and Elevator Company in the mid-1970's.

Cargill's diversification into flour milling has also significantly influenced industry structure. Cargill first entered milling with the 1972 acquisition of Burrus Mills (24). The company then bought Ross Industries in 1973, Seaboard Allied Milling in 1982, and a Hubbard mill in 1985 (table 16; 24). Cargill became one of the largest U.S. flour millers in the early 1980's.

These transactions have realigned the relative size rankings of those firms holding the largest U.S. milling capacities (table 16). Pillsbury ranked as the world's largest flour miller in the late 1970's. The purchase of Peavey led ConAgra to first place in 1983. With the acquisition of International Multifoods, ConAgra reinforced its rank and held 270,000 cwt of productive capacity in late 1988, about 95,300 cwt more than second-ranked ADM (131, p. 10).

Integration and Diversification

Many of these acquisitions have been made by firms that have sizable agribusiness interests. Besides flour milling, ConAgra in 1987 was involved in feed manufacturing, poultry production, grain merchandising, commodity futures brokerage, and the production of various prepared foods (Banquet, Armour, Chun King, Country Pride, and Patio) (13). General Mills' agribusiness interests in 1987 included the Betty Crocker mix lines, the Robin Hood flour lines, Big G cereals, and the Red Lobster and Olive Garden restaurants (19). Pillsbury and ADM have a similar pattern of agribusiness holdings (37, pp. 24-30; 100, pp. 27-34).

Table 14—Number of wheat flour and durum mills by State¹

State/ commonwealth	1973		1987	
	Wheat flour ²	Durum	Wheat flour ²	Durum
<i>Number</i>				
Alabama	1	0	1	0
Arizona	1	0	2	1
California	9	1	9	1
Colorado	3	0	3	0
Delaware	2	0	2	0
District of Columbia	1	0	0	0
Florida	2	0	3	0
Georgia	6	0	3	0
Hawaii	1	0	1	0
Idaho	1	0	0	0
Illinois	7	0	7	0
Indiana	8	0	5	0
Iowa	3	0	2	0
Kansas	21	0	18	0
Kentucky	9	0	7	0
Louisiana	0	1	2	1
Maryland	1	0	1	0
Massachusetts	0	0	0	1
Michigan	9	0	7	0
Minnesota	11	5	12	4
Missouri	8	0	8	2
Montana	3	0	3	0
Nebraska	7	0	6	1
New Jersey	1	0	1	0
New Mexico	2	0	2	0
New York	13	2	11	1
North Carolina	17	0	11	0
North Dakota	1	1	1	2
Ohio	15	0	11	1
Oklahoma	4	0	4	0
Oregon	4	1	3	1
Pennsylvania	37	1	21	0
Puerto Rico	1	0	3	0
South Carolina	7	0	2	0
South Dakota	1	0	1	0
Tennessee	18	0	11	0
Texas	9	0	7	0
Utah	12	0	9	1
Virginia	19	0	10	0
Washington	4	0	4	0
Wisconsin	0	1	0	1
Total	279	13	211	18

¹ State totals may not include some mills under construction at the time of data publication.

² Includes hard-, soft-, and whole-wheat mills.

³ The 1988 Milling Directory/Buyer's Guide total of 211 wheat flour mills in late 1987 does not include 2 mills in Puerto Rico.

Sources: (132, pp. 9, 11; 137, pp. 13, 16).

Cargill provides another example of a company with a wide diversity of agribusiness interests. Cargill operated in 55 different countries in 1987 and employed about 47,000 people. Sales exceeded \$30 billion. Cargill's flour milling plants represent only a small part of the company's diverse agribusiness interests. Other Cargill businesses, located worldwide, included grain elevators, corn wet milling facilities, juice

production plants, malt plants, and tapioca production facilities. Cargill also has integrated egg, broiler, turkey, and beef processing operations, as well as a variety of nonagricultural subsidiaries (47, p. 38).

The rationale behind the expanded milling acquisitions of these companies is not always clear. By expanding their

Table 15—Number of wheat flour and durum mills owned by companies with at least 10,000 cwt of daily capacity¹

Company	1973	1978	1983	1987
<i>Number</i>				
ConAgra, Inc.	17	15	29	24
ADM Milling Co.	9	11	17	20
Cargill, Inc.	—	4	14	14
The Pillsbury Co.	8	8	8	8
Seaboard Allied Milling Corp.	8	10	(Cargill)	(Cargill)
International Multifoods, Inc.	10	9	12	8 ²
Dixie-Portland Flour Mills	3	5	7	6
Peavey Co.	5	9	(ConAgra)	(ConAgra)
General Mills, Inc.	8	8	8	7
RJR Nabisco	3	3	5	1 ³
Ross Industries	4	(Cargill)	(Cargill)	(Cargill)
Cereal Food Processors, Inc.	2	3	4	9
Bay State Milling Co.	5	5	5	8
Colorado Milling and Elevator Co.	4	(Peavey)	(ConAgra)	(ConAgra)
Mennel Milling Co.	5	3	3	3
Fisher Mills, Inc.	1	1	1	1
Bartlett Agri-Enterprises	—	3	3	2
Tennant and Hoyt Co.	4	1	1	(Pillsbury)
Centennial Mills	3	3	(ADM)	(ADM)
Standard Milling Co.	2	2	(Uhlmann)	(ConAgra)
Sunshine Biscuits	3	4	4	(ConAgra)
The North Dakota Mill	1	1	1	1
Acme-Evans	4	4	1	1 ⁵

— = Not in existence.

¹ Acquiring milling companies are in parentheses.

² Acquired by ConAgra in 1988.

³ All but 1 mill acquired by ADM.

⁴ Less than 10,000 cwt daily capacity.

⁵ Acquired by ADM in 1988.

Sources: (132, pp. 12–20, 22–40, 60; 133, pp. 13–25, 26–42, 60; 134, pp. 15–26, 27–49, 69; 137, pp. 19–26, 28–84, 99–100).

plant holdings, diversifying their interests, and integrating vertically, some companies may be able to improve their profitability through cost reduction (121, pp. 81–84). Industrial organization theory indicates that these firms may be able to negotiate lower transport rates; improve scheduling; and spread production, marketing, and financial risks over a large volume of activity. In addition, companies skilled in originating and merchandising grain likely have access to information that is advantageous in sourcing wheat for milling.

Vertical integration and diversification do not, however, necessarily assure lower costs and higher profits. Discussions with the trade suggest that less interbusiness use of procurement economies occurs than might be expected. Integrated operations are often treated as competing profit centers, with profit maximization goals that may be incom-

patible. In fact, the operations of several agribusiness firms have been sold off because of high risk and low profits (24).

Concentration

Concentration in the flour milling industry (wheat flour and durum) has increased substantially in the past 15 years as the largest milling firms have expanded their holdings. In 1987, the top 12 companies owned about 84 percent of total milling capacity, up from 68 percent in 1973 (table 17). (See appendix table 7 for more information.) These 12 companies owned 100 wheat flour and 9 durum mills in 1987, accounting for about 48 percent of all mills in the industry (table 15) and 96 percent of the U.S. flour mills with 10,000 cwt or more of daily capacity (see table 15).

The top four firms (currently ConAgra, ADM, Cargill, and Pillsbury) are collectively increasing their market share at the fastest pace. These top four firms owned about 52 percent of all industry capacity in 1987, up from 34 percent of capacity held by the top four firms in 1973 (table 17). They collectively held 60 wheat flour and 6 durum mills in 1987, constituting 29 percent of all milling plants (see table 15).

Sizable acquisitions by these companies appear to be continuing in the late 1980's. ConAgra (the largest U.S. flour miller) bought International Multifoods (the fifth largest miller) in mid-1988, increasing its market share to 21.3 percent of total U.S. wheat flour and durum capacity by November 1988. The concentration of the top four firms was estimated at nearly 56 percent in late 1988 (55, pp. 1, 14; 131, pp. 10–11).

Conduct of the Flour Milling Industry

Growing per-capita flour consumption affects the conduct of the flour milling industry. Milling companies of all sizes are responding to increased consumption by expanding plant capacities, investing in new plant construction, and modernizing their facilities. Changes in product mix also affect industry conduct. With rising specialty flour consumption, millers now often focus on this industry segment.

New Plant Construction

Although the number of U.S. flour mills is declining, new mill projects are in progress. Between January 1987 and November 1988, for instance, eight new mill projects were either announced or under way, adding nearly 50,000 cwt to daily capacity (table 18). Among the companies involved in these construction projects, only Cargill is in the top four of U.S. milling companies. Two of the companies have ownership connections to European agribusiness interests.

Table 16—Daily flour milling (wheat flour and durum) capacities owned by companies with at least 10,000 cwt of daily capacity¹

Company	1973	1978	1983	1987
	<i>1,000 cwt</i>			
ConAgra, Inc.	88.3	93.0	216.5	191.5
ADM Milling Co.	79.5	96.0	123.0 ²	167.7
Cargill, Inc.	9.0	46.0	134.0	141.1
The Pillsbury Co.	94.7	111.6	121.4	131.7 ²
Seaboard Allied Milling Corp.	62.3	91.0	(Cargill)	(Cargill)
International Multifoods, Inc.	71.7	71.9	78.1	80.3 ³
Dixie-Portland Flour Mills	33.0	47.0	51.0	55.0
Peavey Co.	59.1	98.5	(ConAgra)	(ConAgra)
General Mills, Inc.	55.1	55.1	55.1	62.3
RJR Nabisco	40.0	44.5	43.0	28.0 ⁴
Ross Industries	33.0	(Cargill)	(Cargill)	(Cargill)
Cereal Food Processors, Inc.	17.0	21.9	31.3	68.3
Bay State Milling Co.	29.7	34.9	34.0	55.8
Colorado Milling and Elevator Co.	29.2	(Peavey)	(ConAgra)	(ConAgra)
Mennel Milling Co.	15.0	17.0	21.0	21.0
Fisher Mills, Inc.	15.0	15.0	15.0	15.0
Bartlett Agri-Enterprises	—	14.0	15.0	13.0
Tennant and Hoyt Co.	⁵	10.0	11.0	(Pillsbury)
Centennial Mills	19.0	24.0 ²	(ADM)	(ADM)
Standard Milling Co.	14.5	16.3	(Uhlmann)	(ConAgra)
Sunshine Biscuits	12.2	⁵	⁵	(ConAgra)
The North Dakota Mill	10.0	10.0	18.0	18.0
Acme-Evans	⁵	⁵	10.0	12.0 ⁶

— = Not in existence.

¹ Acquiring milling companies are in parentheses.

² Includes alternating durum capacities.

³ Acquired by ConAgra in 1988.

⁴ All but 1 mill acquired by ADM.

⁵ Less than 10,000 cwt daily capacity.

⁶ Acquired by ADM in 1988.

Sources: (132; 133; 134; 137).

The structure of durum processing is changing particularly rapidly. Four of the eight new mills and over half of total new capacity under construction in 1987/88 will process durum semolina. At the same time, durum plants at Buffalo, Albany, and Hudson, NY; Portland, OR; and St. Paul, MN, that were devoted to durum processing in 1983 were no longer involved in semolina production in 1988 (132, p. 60; 133, p. 60).

The relatively high costs of transporting wheat and flour have encouraged the location of new mills near population areas (see "Mill Locations" section). For instance, the new Miller Milling Company plant near Huron, OH, is located on Lake Erie near the Toledo and Cincinnati markets. The new U.S. Durum Milling, Inc., plant is on the Mississippi River in St. Louis (63, pp. 15-16).

Because these plants are close to consumption areas, they can closely coordinate shipments with demand changes, improving both service and efficiency. The Miller Milling and the U.S. Durum Milling plants have access to economical water transportation for shipping durum wheat from Duluth-

Superior on the Great Lakes and from Minneapolis-St. Paul on the Mississippi River. Only Panhandle Milling and Dona Ana have located in the heart of production areas to provide a market for locally produced wheat.

These new mill additions have been met with skepticism. Some milling observers wonder whether the market, particularly for pasta, is experiencing the kind of growth necessary to justify additional capacity (193, p. 8).

Buying and Processing Wheat

Before purchasing wheat, flour millers typically send representatives to production areas at harvest time to obtain samples from fields and country elevators. Cereal chemists then analyze the samples to classify wheats for different end uses. The Kjeldahl test, for instance, measures the protein content of wheat or flour samples. Other tests performed on bread flour samples include the farinograph test, which analyzes dough plasticity and mobility; the Pekar test, a visual inspection for the presence of bran specks; and the amylograph test, which examines viscosity (115, p. 2). Final-

ly, bread is baked from the sample and analyzed for loaf volume, texture, crumb color, and absorption.⁶

These factors partly determine where wheats are purchased. Because of changing weather conditions, a particular area with an excellent wheat crop one year may produce a poorer quality wheat the next year, with no change in cropping practices or varieties planted. Factors other than weather conditions that determine purchase locations include area soils, varieties grown, the price situation, transportation circumstances, and customer demands in any given crop year (114, pp. 3, 6).

Millers, particularly those who mill wheats for bread flour, typically buy wheats of a specific protein content. Wheats with the highest protein contents (hard red spring and hard

⁶ Wheats used for products other than bread are analyzed for different end uses. Pasta is analyzed for firmness, color, cooked weight of product, and other criteria.

Table 17—Concentration of milling capacity among wheat flour and durum mills

Size grouping	1973	1978	1983	1987
<i>Cwt of capacity</i>				
4 largest	334,200	399,100	594,900	632,000
8 largest	550,650	664,100	822,100	898,600
12 largest	675,500	813,500	926,400	1,020,600
All firms	997,107	1,099,610	1,174,206	1,217,276
<i>Percent share of market</i>				
4 largest	33.5	36.3	50.7	51.9
8 largest	55.2	60.4	70.0	73.8
12 largest	67.7	74.0	78.9	83.8
All firms	100.0	100.0	100.0	100.0

Sources: Tables 11 and 16.



Many mills buy wheat continuously throughout the year because of their large volumes, holding it in grain storage facilities like these until it is milled.

red winter) are typically blended to produce bread flours (fig. 2). Wheats with lower protein contents (soft red winter and white wheats) result in flours for baking cakes, crackers, cookies, and muffins. The protein level demanded by millers, especially for bread flour, remains fairly constant, even though protein content can vary substantially from year to year. Ideal growing conditions producing high yields typically provide lower protein contents and vice versa (22, p. 13).

Differences in protein levels among years can significantly affect the wheat classes purchased by millers. In years when the hard red winter crop has low protein, millers of bread flour generally purchase larger amounts of hard red spring wheat and blend the two classes. Protein premiums for hard red spring wheat can then be quite high, particularly if supplies are tight. If the protein content of hard red winter wheat is high, in contrast, millers require less hard red spring wheat for blending, and premiums are lower (22, p. 13). These factors influence the location of mill purchases and the final wheat input costs to the mill.

Within practical limits, the process of fine grinding and air classification permits greater substitutability among wheat classes. When air classification is used, finely ground flour is channeled to a classifier, where swirling air funnels the larger particles away from the smaller, high-protein "fines." Repeating this procedure results in the separation of 20-30 percent of the flour from hard wheat into a low-protein product suitable for cakes and pastries. Five to 15 percent of the flour comprises the fine fraction containing 15-22 percent protein (191, p. 60). Air classification does not alter wheat quality, but provides a method for concentrating particles with different characteristics.

Air classification has both advantages and disadvantages. Air classification helps millers because it can be used to tailor a flour of exact protein content to a buyer's specifications. In addition, air classification can free millers from purchasing wheats from distant locations that have specific protein contents (191, p. 60). When hard red winter wheat has low protein, for instance, Kansas and Oklahoma millers with air classification facilities can produce high-protein fractions from the available wheat, eliminating the expense of shipping hard red spring wheat from the Dakotas.

Air classification equipment is relatively expensive, however, and its use of energy is quite intensive. Primarily because of the energy factor, few mills are currently equipped with air classification equipment. In the mid-1980's, Pillsbury was acknowledged to have been one of the leading companies in air classification milling (24).

Although extraction rates from wheat to flour vary considerably from month to month, flour yields appear to increase little from year to year (tables 19 and 20). The milling process

Figure 2

Protein range and flour uses of major wheat classes

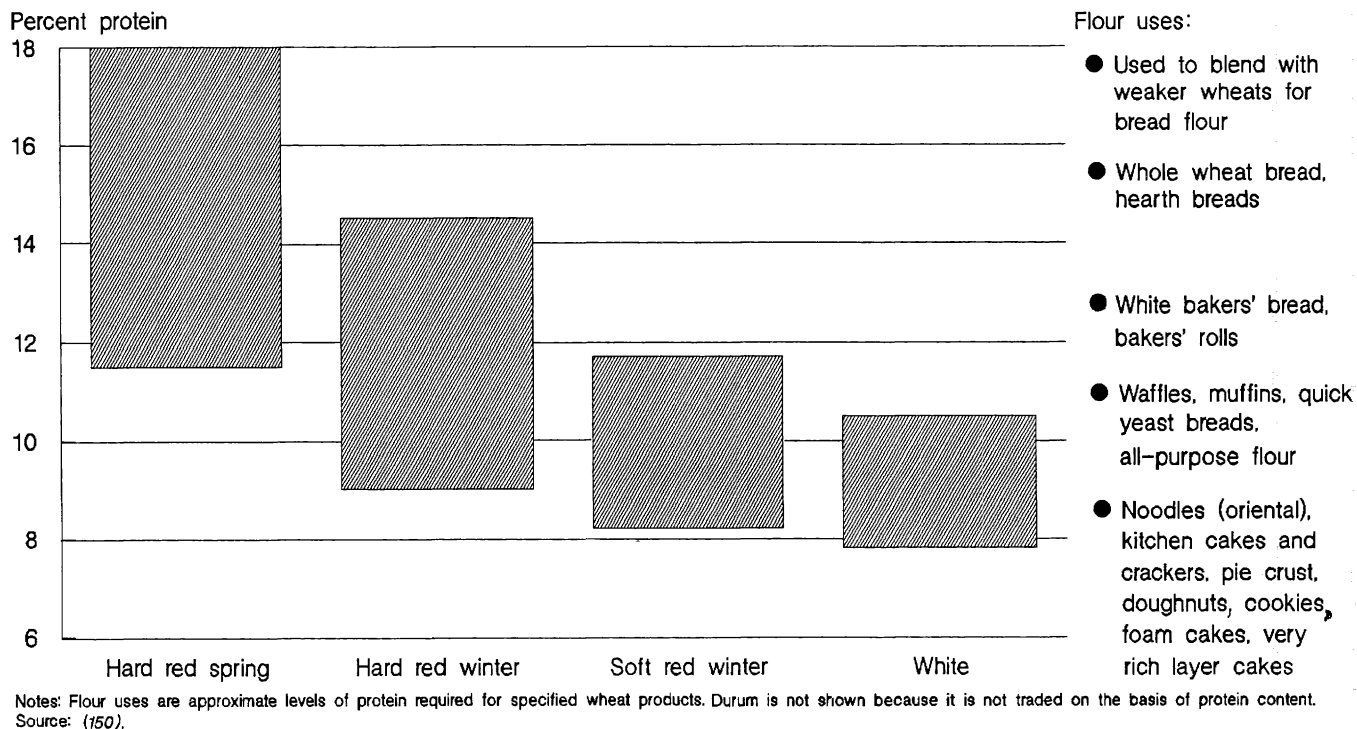


Table 18—Major mill construction projects, January 1987–November 1988

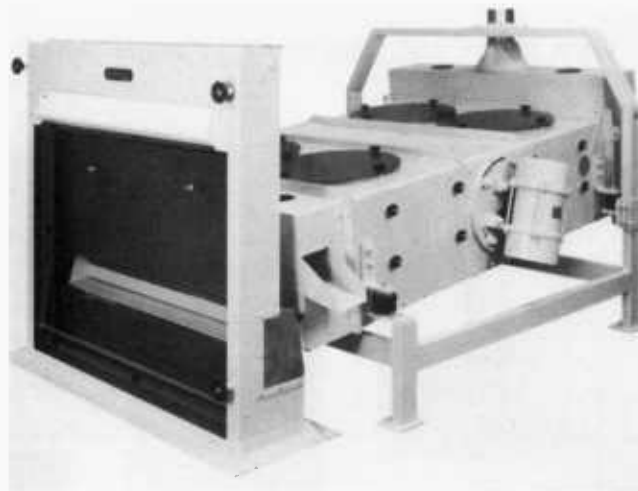
Company	Location	Remarks/daily capacity
American-Italian Pasta Co.	Excelsior Springs, MO	All production dedicated to adjoining pasta plant; facility will receive 25-car unit trains of North Dakota durum (5,000 cwt semolina)
Bay State Milling Co.	Clifton, NJ	Rebuilding of plant damaged by fire in 1984; produces bread, whole wheat, and high gluten flours for Northeastern bakers (10,000 cwt bread flour; 2,000 cwt whole wheat flour)
Dona Ana Specialty Flour Milling, Inc.	Rincon, NM	Farmers with U.S. entrepreneur; management expects to fill specialty orders (1,000 cwt wheat flour)
Miller Milling Co.	Huron, OH	Built in a former feed mill adjacent to a grain elevator owned by Pillsbury; cooperative agreement will allow storage at Pillsbury (6,000 cwt semolina)
Panhandle Milling Co.	Dawn, TX	Farmer cooperative providing a local market for Southwestern wheat (3,000 cwt wheat flour)
U.S. Durum Milling, Inc.	St. Louis, MO	Adjoins company elevator on Mississippi River; produces semolina for pasta markets in Missouri, Tennessee, and Louisiana (6,000 cwt semolina)
Harvest States Cooperatives (Amber Milling Division)	Chicago, IL	Location selected for its rail access to cooperative members and for its proximity to a major consumption area (7,500 cwt semolina)
Cargill, Inc.	DeVore, CA	Cargill's first mill in the West and first mill construction project; all other Cargill mills acquired as ongoing businesses (7,000 cwt wheat flour)

Sources: (46, p. 11; 48, p. 56; 104, p. 20; 105, p. 7; 193, pp. 8–10).

has generally yielded about 74-75 percent flour over the past 15 years. Several factors influence flour yields. Yields are usually higher, for example, in cooler, dry weather than in hot, humid weather. Crop deterioration can reduce yields. Yields vary depending on mill efficiency. Yields can also differ by wheat class and by type of flour: white wheats have the highest yields, followed by hard and soft wheats. In addition, specialty flour production often results in higher yields than the yields from white flour because specialty flours (whole wheat, cracked wheat types) use a larger fraction of the kernel (24).

Mills of small and intermediate size typically buy wheat under single- and multiple-car rates from country elevators and subterminals. Larger mills often receive unit-train shipments from subterminal and terminal facilities under contract rates. Each car in a unit train is filled with the same commodity. Integrated firms, such as Cargill and ADM, hold elevators that not only supply company mills but are also actively involved in other grain transactions. Shipments from farmers to mills, although representing a small fraction of total mill receipts, are important in some areas (24).

Because wheat quality can be determined only near harvest, millers do not often forward contract with farmers for production (24). When variations in wheat quality among areas are known, millers commonly enter into "to-arrive" contracts with elevators. "To-arrive" contracts are typically for delivery within 20-90 days and specify premiums and discounts for deviations in quality.



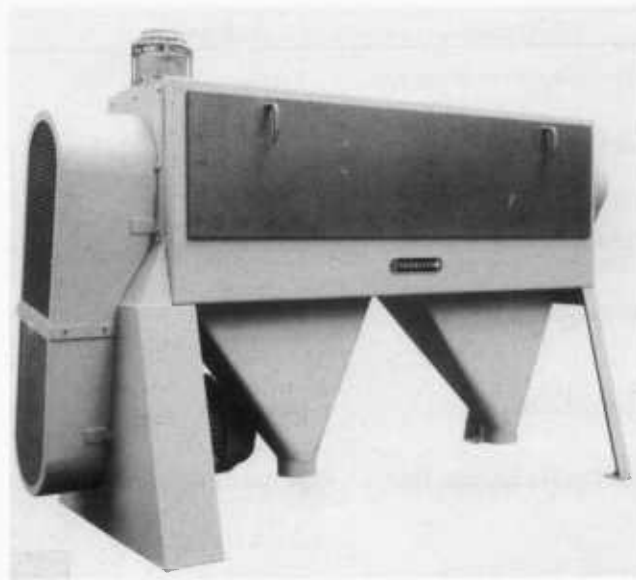
A separator's angled, reciprocating screens remove sticks and other coarse and fine materials from wheat in an early stage of flour milling.

Millers often hedge purchases in futures contracts traded at Minneapolis, Kansas City, or Chicago. To ensure the effectiveness of hedging, millers must understand supply and demand conditions and the potential effect of market changes on both cash and futures prices.

All mills have storage facilities allowing the stockholding of wheat. Small mills may have the opportunity to store adequate wheat supplies to use for several months of flour production.



Wheat kernels that have been stripped from the hull are cleaned and then milled. Milling is a grinding process that separates the inner, edible part of the kernel from the outer coatings to produce flour.



Dry scourers are used in the wheat-cleaning stage of flour milling. The machinery removes dirt and husks sticking to the grain and rids the wheat of impurities such as dust, sand, and small seeds.

Table 19—Wheat flour extraction rates by year

Year	Wheat flour production	Wheat ground for flour	Average extraction
	----- 1,000 cwt -----		Percent
1973	254,661	340,372	74.8
1974	251,097	337,777	74.3
1975	258,985	349,605	74.1
1976	275,077	370,970	74.2
1977	275,784	370,875	74.4
1978	277,950	372,793	74.6
1979	284,051	381,825	74.4
1980	282,655	377,135	74.9
1981	283,966	380,629	74.6
1982	290,907	391,924	74.2
1983	311,587	419,371	74.3
1984	299,832	405,163	74.0
1985	313,815	420,091	74.7
1986	326,316	442,522	73.7
1987	338,484	456,275	74.2

Sources: (168, p. 1; 169, p. 1; 170, p. 1; 171, p. 1).

Larger mills purchase wheat continuously throughout the year because of their large volumes. These large plants constantly source wheat from widespread locations. Because flour is milled to specifications, millers usually store wheat rather than flour (24).

Selling Mill Products

When milled, a standard hard wheat yields farina, patent flour, first clear flour, second clear flour, wheat germ, middlings, and bran. Millers sell different flour types to bakers of breads, cakes, cookies, and crackers and to manufacturers of breakfast cereals and pet foods.

Small amounts of flour are also used for industrial purposes. The main industrial uses include plywood and composition board adhesives, industrial starch (for laundries, textiles, pastes, and paper additives), and industrial alcohol. Minor uses include whiskey, beer, cosmetics, fertilizers, paving mixes, and polishes. Hard and durum wheats account for approximately 85 percent of the milled wheat products used for industrial purposes (22, p. 36; 34; 145, p. 21). Manufacturers of livestock feeds primarily buy millfeeds (bran and middlings).

Flour. Different grades of flour are obtained depending on the type of wheat and the fineness of grind (22, p. 6). In most hard wheat mills, 75-80 percent of the flour produced is short patent flour. The remaining 20-25 percent of the flour can be run together as first clears or divided into second and fancy clears. The extra-short or fancy patent flour has the finest grind, with grades dropping down the scale to clears (191, p. 56). The protein content of hard wheat flours varies from 11 percent for "straight" flour (all blends) to 25 percent

Table 20—Wheat flour extraction rates by month

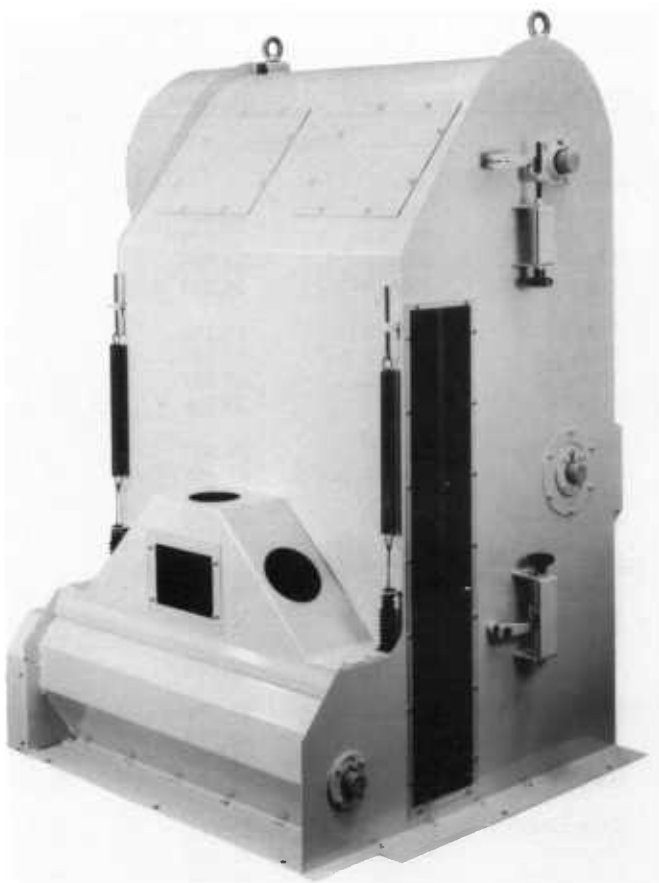
Year/month	Wheat flour production	Wheat ground for flour	Average extraction
	----- 1,000 cwt -----		Percent
1986:			
January	26,582	36,007	73.8
February	26,343	35,524	74.2
March	24,515	32,731	74.9
April	25,333	34,223	74.0
May	26,000	35,178	73.9
June	25,538	34,577	73.9
July	26,440	35,987	73.5
August	28,897	39,256	73.6
September	29,085	39,567	73.5
October	30,422	41,491	73.3
November	28,934	39,508	73.2
December	28,227	38,473	73.4
1987:			
January	26,020	35,234	73.8
February	26,363	35,785	73.7
March	27,723	37,266	74.4
April	26,683	36,725	72.7
May	28,932	39,304	73.6
June	28,461	38,199	74.5
July	27,384	37,037	73.9
August	29,538	39,426	74.9
September	29,067	39,113	74.3
October	31,068	41,340	75.2
November	29,539	39,691	74.4
December	27,706	37,155	74.6

Source: (168, p. 2).

or more for fancy, extra-short patent flour (22, p. 6). Prices quoted to buyers for different flour types vary according to such factors as the protein level, ash content, absorption, and mixing strength of the flour (190, pp. 6, 14, 25-26; 191, pp. 63-64).

A soft wheat mill may process 50 percent of its flour as fancy patent cake flour and the rest as fancy clears (22, p. 6). Soft wheat flours are sold to cookie, cake, and cracker producers and to canners who make soups, gravies, flour-based sauces, and desserts requiring thickening. Soft wheat flours are classified by such factors as protein level (much lower than for bread-type flour), ash content, crumb texture, and mixing strength (190, pp. 19, 24-25). Soft-wheat flour users such as cookie and cake bakers also emphasize such factors as cake volume, cookie diameter, and cake score.

Although the milling of durum wheat resembles that of hard and soft wheats, this process requires special equipment. Additional purifiers are used to separate the bran from the desired semolina, a coarse granulation of endosperm. Pasta companies then buy semolina, which contains only 3 percent flour. Durum millers also produce "granulars," or grind the wheat into flour for special use in pasta products (191,



After the wheat passes through separators, aspirators with internal air jets are used to remove light impurities from wheat.

p. 73). Pasta producers closely monitor the effect of different wheat purchases on color, noodle yield, cooked weight, noodle score, and dough consistency (190, pp. 10-11, 24-25).

Millers often sell flour in both bulk quantities and in bags. For shipments to domestic bakers, millers typically use pneumatic trucks (for bulk deliveries), pneumatic hopper cars (bulk), or ordinary freight cars and trucks (bags and containers). Pneumatic transport requires mixing the flour with a small amount of pressurized air. In this form, the flour can be pumped from the loading dock of a mill into special trucks or rail cars, transported to its destination, and pneumatically forced into storage for use as needed (191, p. 58).

Flour sales are typically made through negotiation, particularly for large quantities and special mixes. In developing a price quote for a specific flour or wheat mix, millers must analyze a variety of factors. They must consider wheat requirements and sources, should wheat be unavailable in inventory to fill a baker's specific request. Millers must estimate wheat prices from stocks on hand, market directions, and the availability of old crop and new crop wheat. Flour



Double diagonal roller mills are used to break wheat into coarse particles during the milling process that converts wheat to flour.

and byproduct yields must be estimated from the type of wheat required. Competitors' prices also constitute an important factor in determining price levels. The effectiveness of the final quote depends on the number of bids accepted and the margin between the bid quote and actual costs (115, pp. 3-4).

After agreeing on a price, the flour shipment is booked, and the buyer issues shipping directions. Delivery typically falls into 30-, 60-, 90-, or 120-day intervals. The interval is sometimes as long as 1 year. Bookings of 60 days represent the norm for hard wheats; soft wheat bookings often involve longer periods (24). If the advance booking exceeds 60 days, millers typically impose a carrying charge because of the added storage and interest risk. Bakers frequently book shipments directly after harvest (July and August) when both cash and futures prices are seasonally low (24).

Wheat must be ground according to specifications if the flour required by the baker is not in inventory near shipping



A flour miller checks the roller mill setting for proper grind. Grinding is part of the gradual reduction of wheat into flour.



Sifters contain sieves of increasing fineness that refine the wheat or flour granules into smaller, smoother particles.

wheat in inventory constantly change during the year, making uniform blending over time a difficult task (114, p. 7).

Wheat Gluten. The growing use of vital wheat gluten, an important industry trend, is enhancing the flexibility of both millers and bakers. Wheat gluten is about 75 percent protein. Bakers who use wheat gluten need not maintain an inventory of flours with varying levels of protein for producing breads, rolls, and buns. Instead, basic flours can be fortified with gluten to produce the desired protein level. In addition, poor-performing shipments of flour can be similarly strengthened to obtain the desired effect (111, pp. 3-4).

The use of vital wheat gluten in bakery products has other advantages. Use of wheat gluten increases water absorption, improving the moistness, softness, and shelf life of products. Dough handling and mixing characteristics are improved, resulting in greater gas retention and better flavor. In addition, gluten increases the volume of bread loaves and reduces the breakage of pasta products (111, p. 4).

Gluten is obtained by “washing” a dough of wheat flour and water. Bakery engineers suggest using wheat gluten at a level of 2-3 percent flour basis in hard rolls and specialty breads, and at a level of 1/2-2 percent in sweet rolls, doughnuts, crackers, and pretzels (111, pp. 3, 8).

The growth in U.S. wheat gluten consumption has been satisfied mainly through imports. Imports in the late 1980's account for about 50 percent of the total U.S. wheat gluten supply (24). The quantity of gluten imports increased by about 123 percent between 1975 and 1987 (table 21). Australia and Canada supply the majority of U.S. gluten imports, respectively accounting for 40 percent and 29 percent of the total. In 1987, the United States imported wheat gluten from about 25 countries (162).



Purifiers take coarse, rolled wheat particles and, via a series of sieves and air currents, separate the bran particles (byproducts) from the middlings. Then smooth-surfaced rolls and sifters reduce middlings into flour.

time. A mill may have more than 100 different lots of wheat, each describing a dozen or more quality characteristics, that must be considered in the blending process. Companies are increasingly using linear programming to determine the lowest cost mix of wheats. Many millers, however, still consider milling as more of an art than a science. With the continuous arrival of new wheat, the types and characteristics of



Bread flour samples undergo the farinograph test, which predicts dough plasticity and mobility.



Once "purified" and sifted, flour is packaged in sacks and readied for shipping.

Millfeeds. Millfeeds emerge at different "breaks" in the process of milling wheat into flour. At the "first break," rotating corrugated rolls generate broken pieces of wheat and bran. These wheat and bran pieces sift through a series of screens where large and small particles are separated.



Some flour is bulk loaded. Here, 50,000 pounds of flour are pumped pneumatically from a mill loading dock into a special tanker truck for delivery to a bakery customer.

These particles are then carried to a purifier where air channels and bolting cloth separate coarse fractions by size and quality. The successively finer corrugations of four to five additional "break rolls," each followed by sifting and purifying, reduce the wheat particles to flour, granular "middlings" (or shorts), germ meal, and other byproducts (see glossary; also, 35, p. 4).

The United States officially recognizes six primary wheat byproducts (table 22). The production of these different types of millfeeds depends on the type of wheat and the speed, pressure, and corrugation of the rollers. By controlling these factors, millers exercise a high degree of discretion in determining the final output (35, p. 4). The most widely traded types of millfeeds are bran and middlings (particles of wheat bran and the wheat kernel).

The supply of wheat byproducts has grown substantially during the 1970's and 1980's (table 23). Millfeed supply increased from 5 million tons in 1975, for example, to 6.4 million tons in 1986. Two factors explain this upward trend. Because flour and millfeeds are joint products, the growth in flour consumption has resulted in increased production of millfeeds. In addition, declining middlings prices (table 24) have prompted increased millfeed use in the 1980's.

Wheat byproducts traditionally have been used as animal feeds. Bran, which is high in fiber and low in energy, is used in rations for breeding stock and growing young animals but is not typically recommended as a finishing ration for either cattle or hogs. (Lean-type hogs remain the primary exception.) Middlings are used in feeding mainly as a source of energy and are frequently a component of ground-grain

Table 21—Imports of wheat gluten

Year	Quantity	Value
	<i>Metric tons</i>	<i>1,000 dollars</i>
1975	15,001	10,958
1976	21,031	18,247
1977	23,955	23,242
1978	23,428	19,716
1979	23,974	21,392
1980	20,777	22,607
1981	20,570	22,146
1982	19,925	17,906
1983	22,237	24,103
1984	24,291	26,417
1985	25,547	24,725
1986	27,300	30,116
1987	33,527	40,736

Source: (148).

formula feeds. Substitution of wheat millfeeds for other grains is fairly limited. Nutritionists recommend that bran and middlings replace no more than 15-30 percent of the energy content provided by other grains (24).

Millfeeds form a relatively small component of the total U.S. feed supply. During the 1960's, for instance, wheat millfeeds accounted for only 3-4 percent of all grains and grain byproducts fed to livestock (35, p. 18). This fraction continues to be relevant in the late 1980's. Wheat millfeeds use, at 6.4 million tons in 1986, was dwarfed by the 126 million tons of corn fed to livestock in that year (table 25).

Wheat millfeeds constitute a much larger element of feed manufacturing use than of total feed use. Survey data for 1984 indicate that wheat millfeeds accounted for about 10 percent of the total quantity of grains and grain byproducts used in the U.S. feed manufacturing industry (table 26). Wheat millfeed use, at 6.2 million tons, overshadowed the use of all other byproducts, ranking third among all feed grains and byproducts. Only corn, at 32.3 million tons, and sorghum, at 6 million tons, surpassed wheat millfeeds as ingredients in the feed manufacturing industry.

The use of wheat millfeeds in feed manufacturing varies by region (table 26). Wheat millfeeds represent over 60 percent of byproduct ingredients used in feed manufacturing in the Lake States, Corn Belt, and Northern Plains. In 1984, the Corn Belt alone consumed 1.7 million tons of wheat millfeeds in feed manufacturing. Wheat millfeed use in the Southeast, at 23 percent of all byproducts, lags behind that in other regions.

The prepared feed and pet food industries purchase large quantities of millfeeds because of their feeding value. These industries respectively consumed about 2.8 and 0.2 million tons of wheat millfeeds in 1982, totaling slightly over 50 per-

cent of U.S. millfeed production (177, p 20D-32). These inputs represent 6 percent of the feed ingredients purchased by the prepared feed industry and 3 percent of the feed ingredients purchased by the pet food industry. To a lesser extent, millfeeds are purchased by feedlots and farmers. Breakfast cereal manufacturers purchase small quantities of wheat germ and bran (35, p. 5).

Millfeeds are sold in either bulk or in bags, and prices are typically negotiated (24). Millfeed prices are largely influenced by the prices of substitute grains, particularly corn, and the substitutability among grains. Other price-determining factors include the wheat price, byproduct yields, the level of competitors' prices, and livestock numbers. Wheat millfeed prices have closely followed corn prices over time partly because of the substitutability of the two grains and the overwhelming importance of corn for feed use (24).

Specialty Flours. Industry participants agree that a large proportion of the increase in domestic per-capita flour consumption in the 1980's is in the form of specialty flours. Consumption of whole wheat breads, for instance, doubled between 1967 and 1985, reaching 9 pounds per person in 1985. Over the same period, consumption of whole grain and variety breads (rye, pumpernickel, French, and Italian) increased 12 percent (64, p. 40). In addition, Americans are eating more than 14 pounds of pasta per person in the late 1980's, up more than 40 percent from the consumption levels of the late 1970's (147, p. 56).

Many analysts indicate that this boom period should continue over the next several years. For example, the president of National Grain Products estimated that specialty flour use at his company rose by nearly 9 percent in 1986 alone (85, p. 36). According to a ConAgra representative, specialty flour production is growing at a faster rate than overall wheat flour production (85, p. 26). Other trade members assert that consumption gains should continue for some time (85, pp. 26, 29).

Other analysts are less optimistic. For instance, one observer predicted that future growth in the specialty flour market will not be as large as in recent years (85, pp. 32, 36):

I think we've seen a more dramatic increase in the recent past than we will see in the next year or two. There's still a potential for increased sales of specialty flour because of population increases, but I question if we haven't already experienced our largest growth.

Although several factors have spurred the recent growth in specialty flour consumption, the increasing nutritional awareness of consumers has been perhaps the most important influence. Multigrain and high-fiber breads, which are fre-

quently made with whole wheat and bran flour, attract nutrition-conscious consumers. At the same time, demand for crushed wheat and high-gluten flours used in bread production also has been rising.

Growing consumer interest in new and different foods has also sparked greater demand for specialty flours. The market for whole wheat items has exploded in the 1980's. Consumption of ethnic foods, such as pizzas, tortillas, and

Table 22—Primary wheat byproducts officially recognized in the United States

Byproduct	Description	Use
<i>Wheat bran</i> Often accounts for 50% of millfeed production	The coarse outer covering of the wheat kernel, flour, and finely ground weed seeds and other nonwheat material.	Chiefly fed to dairy cattle. Usually 13.5–15% minimum protein, 2.5% minimum fat, and 12% maximum fiber.
<i>Middlings</i> Often about 45% of millfeed production	Fine particles of wheat bran, shorts, germ, flour, and offal from the “tail of the mill.”	Used in all types of formula feeds. Usually 10–14% minimum protein, 3% minimum fat, and 9.5% maximum fiber.
<i>Millrun</i>	Coarse wheat bran, shorts, germ, flour, and offal from the “tail of the mill”; a blend of bran and middlings.	Used primarily in beef and dairy cattle feeds. Usually 14–16% minimum protein, 3% minimum fat, and 9.5% maximum fiber.
<i>Shorts</i> Produced primarily at mills in the Southwest that confine bran and short production to a 50/50 ratio.	Fine particles of bran, germ, flour, and offal from the “tail of the mill”; contains more flour than middlings.	Used mainly as a feed ingredient for broilers and layers. Usually 14–16% minimum protein, 3.5% minimum fat, and 7% maximum fiber.
<i>Red dog</i>	Offal from the “tail of the mill,” fine particles of wheat bran, germ, and flour; contains more floury particles than other millfeed byproducts.	Used as an ingredient in baby pig feed, dog food, and, to a small extent, as an ingredient in milk replacers. Usually 13.5–15% minimum protein, 2% minimum fat, and 4% maximum fiber.
<i>Germ meal</i>	Wheat germ, together with some bran and middlings or shorts.	Used as an ingredient in mink and horse feeds, some types of specialty cattle feeds, and dog food. Usually 25% minimum protein, 7% minimum fat, and 4% maximum fiber.

Source: (35, pp. 4–5).

Table 23—Supply and disappearance of wheat millfeeds

Year ¹	Production	Imports	Total supply	Domestic disappearance	Exports	Total disappearance
<i>1,000 short tons</i>						
1975	4,903	129	5,032	4,933	99	5,032
1976	4,883	160	5,043	4,797	246	5,043
1977	4,853	224	5,077	4,970	107	5,077
1978	4,879	189	5,068	4,944	124	5,068
1979	4,898	136	5,034	4,851	183	5,034
1980	5,052	136	5,188	5,118	70	5,188
1981	5,367	129	5,496	5,344	152	5,496
1982	5,612	122	5,734	5,665	69	5,734
1983	5,448	167	5,615	5,598	17	5,615
1984	5,442	184	5,626	5,604	22	5,626
1985	5,832	137	5,969	5,962	7	5,969
1986	6,297	108	6,405	6,367	38	6,405

¹ October 1–September 30.

Source: (142).

bagels, is also increasing (20, p. 7A). As bakers attempt to expand their market share, they increasingly cater to all market segments—the young, elderly, ethnic groups, and small households—and, at the same time, stimulate the demand for specialty flours.

The primary users of specialty flours include wholesale bakers, supermarket captive bakeries, cereal manufacturers, pizza and tortilla producers, and other food processors. The vast majority of specialty flours are processed before they

Table 24—Average wholesale prices for wheat middlings at Kansas City, Minneapolis, and Buffalo

Year ¹	Kansas City	Minneapolis	Buffalo
<i>Dollars per ton</i>			
1975	87.08	84.38	92.21
1976	85.62	86.42	95.47
1977	68.49	63.91	79.89
1978	85.65	78.27	90.19
1979	95.05	82.73	100.17
1980	104.74	94.23	115.25
1981	83.02	72.33	88.14
1982	85.34	68.05	87.47
1983	96.94	82.53	106.94
1984	68.67	49.96	76.32
1985	59.83	46.31	69.25
1986	44.77	32.48	49.00

¹ September 1–August 31.

Source: (141).

Table 25—Domestic use of commercial feeds and selected feed grains for all feeding purposes

Year ¹	Commercial feeds		Selected feed grains	
	Wheat millfeeds	Other ²	Corn	Sorghum
<i>1,000 tons</i>				
1975	5,032	26,235	99,932	13,832
1976	5,043	23,995	100,520	11,508
1977	5,077	26,784	104,076	12,544
1978	5,068	28,442	119,392	15,064
1979	5,034	29,916	127,400	13,860
1980	5,188	27,681	116,368	9,044
1981	5,496	28,745	116,732	11,676
1982	5,734	29,741	126,616	13,860
1983	5,615	27,432	106,904	10,780
1984	5,626	32,066	114,240	15,064
1985	5,969	30,902	114,660	18,536
1986	6,405	31,129	126,028	15,400

¹ October 1–September 30.

² Includes oilseed cake and meal (soybean, cottonseed, linseed, peanut, and sunflower); animal protein (tankage and meatmeal, fish meal, and dried milk); and other mill products (gluten feed and meal, rice millfeeds, brewers' dried grains, distillers' dried grains, dried and molasses beet pulp, and alfalfa meal). Year beginning October 1 except for peanut cake and meal, which begins August 1.

Sources: (142; 161, pp. 4, 31, 39, 44, 51, 55).

are sold to consumers. Several indications point to declining supermarket sales of packaged specialty flours (85, p. 32).

Performance of the Flour Milling Industry

Although concentration in the flour milling industry is increasing, most observers agree that the industry remains highly competitive in price, quantity, and product lines. Millers continue to expand capacity in response to greater flour consumption levels. Milling observers concur, however, that competition among mills has translated into low industry margins.

Profitability

Industry analysts agree that millers historically have experienced low margins as a percentage of sales. Goldberg, for instance, stated that net income (after taxes) as a percentage of sales ranged from -0.11 percent to 3.28 percent for major flour milling firms from 1977 to 1982. For diversified firms, Goldberg found that the flour milling divisions had lower earnings than the average earnings for the total company (21, p. 5).

Industry observers have noted several factors contributing to the generally low profitability of the industry. These observers contend that millers typically treat flour as an undifferentiated, very price-sensitive commodity and believe that the lowest price, highest volume operation gets the business. Because of this intensely competitive atmosphere, margins at times have been reduced to quite low levels (90, p. 48).

Other analysts argue that the problem has been caused by millers' focus on expanding capacity use rather than market planning as a means of enhancing profits (76, p. 16). These observers contend that product differentiation is necessary to increase profitability and argue that accounts can be won by focusing on quick and accurate responses, consistent product quality, and the development of market niches (76, p. 16). The chairman of the Millers' National Federation expressed these ideas at the Federation's annual meeting in 1986 (79, p. 7):

If we are dissatisfied with our performance, it's up to the individual flour milling company managers to take the steps necessary to transform opportunities into positive, concrete results. That will require us to be more innovative. It will require us to be more productive. And it will require us to be more cost effective.

I believe many of us will have to concentrate on niches in our industry. Our markets will continue to be more segmented. We will have to look toward more added value products. This

Table 26—Domestic use of grain byproducts and feed grains in feed manufacturing, 1984

Region	Grain byproducts		Feed grains		Total ³
	Wheat millfeeds	Other ¹	Corn	Other ²	
1,000 tons					
Northeast	892	1,176	3,438	378	5,884
Lake States	481	257	3,176	351	4,266
Corn Belt	1,681	1,085	4,498	1,366	8,629
Northern Plains	661	309	1,942	1,799	4,711
Appalachia	606	463	3,226	379	4,674
Southeast	242	788	4,508	703	6,241
Delta	173	152	2,656	1,053	4,034
Southern Plains	659	993	2,979	3,832	8,463
Mountain	452	311	923	1,367	3,053
Pacific	363	354	4,908	3,008	8,632
Total ⁴	6,210	5,887	32,254	14,236	58,587

¹ Other grain byproducts include brewers' grains, distillers' grains, corn gluten meal, corn gluten feed, hominy feed, soybean millfeeds, and small quantities of other byproducts.

² Other feed grains include sorghum, barley, oats, wheat, and small quantities of other grains.

³ Total grain byproducts and feed grains. Totals may not add due to rounding.

⁴ Totals may not add due to rounding.

Source: (2, pp. 120, 122).

means we will have to concentrate, even more intensely, on the changing needs of our customers. The successful flour miller will foresee the future needs of his customer and beat competition to the punch in providing the products and services needed.

Despite industry rhetoric, an accurate picture of industry profitability in the late 1980's is difficult to grasp. Somewhat contrary to industry statements, milling margins in the late 1980's appear considerably larger than in earlier years (see "Milling Margins" section).

In the late 1980's, the direction of milling profits remains uncertain. Growing consumer demand has the potential to raise milling profits in coming years. If the U.S. Government remains willing to use export enhancement to promote sales, flour exports will likely rise further. Greater millfeed use, in response primarily to increased cattle feeding, may also raise industry profits (58, p. 7).

Several factors, however, will likely offset potential profit growth. The growing size and sophistication of bakers may dampen millers' margin gains. In addition, uncertain railroad rates under deregulation may, in some cases, handicap the cost situation of affected mills (83, p. 15).

Capacity Use

Capacity use in the milling industry (measured by flour output as a percentage of total annual capacity based on a 6-day, 24-hour-per-day week) has grown significantly over time. Annual capacity use rose from slightly over 50 percent in 1947 to over 80 percent in the 1970's and to more than 90

percent in 1986 and 1987 (90, p. 46). Milling capacity use in 1986, at an annual average of 90.8 percent, exceeded the 79.8 percent registered by all manufacturing industries in that year (table 27; 76, p. 16). In 1987, capacity use reached 92.6 percent. Use surpassed 100 percent of capacity in November 1986 and November 1987 (table 28).

Milling Margins

Milling margins, largely affected by competition among millers and the market power of buyers, provide another indication of industry performance. Between the 1970 and 1986 marketing years, margins at Kansas City and Minneapolis for 100 pounds of flour and the associated byproducts typically have varied from 10 to about 40 percent of the cost of the wheat (tables 29 and 30). Margins have generally increased over time, jumping substantially in the 1972-73 and 1975-76 marketing years at both Kansas City and Minneapolis. Margins averaged 90 cents higher in Kansas City and 77 cents higher in Minneapolis after 1976 than between 1970 and 1976.

Margin levels vary considerably between markets because of differences in the supply of and demand for the hard red winter (Kansas City) and dark northern spring (Minneapolis) classes. From 1970 through 1974, for instance, the Minneapolis margin averaged 49 cents per cwt above that of Kansas City. This differential rose to 74 cents in the 1976 marketing year, declining in each of the following years to a low of -24 cents in the 1980 marketing year. Although the differential approached more traditional levels (about 10-40 cents per cwt in the early 1980's), it rose to \$1.05 in the 1985 marketing year and to \$1.15 in the 1987 marketing

Table 27—Annual milling capacity, flour production, and use of potential capacity

Year	Actual daily capacity	Annual milling days ¹	Potential annual capacity	Annual flour production	Annual capacity used
	<i>1,000 cwt</i>	<i>Number</i>	<i>----- 1,000 cwt-----</i>		<i>Percent</i>
1970	987.962	307	303,304	253,094	83.4
1971	972.736	307	298,630	249,810	83.7
1972	993.875	308	306,114	250,441	81.8
1973	990.000	307	303,930	254,661	83.8
1974	1,010.000	307	310,070	251,097	81.0
1975	1,042.000	307	319,894	258,985	81.0
1976	1,040.628	308	320,513	275,077	85.8
1977	1,072.143	307	329,148	275,784	83.8
1978	1,058.873	306	324,015	277,950	85.8
1979	1,054.589	307	323,759	284,051	87.7
1980	1,059.643	308	326,370	282,655	86.6
1981	1,062.950	307	326,326	283,966	87.0
1982	1,120.142	307	343,884	290,907	84.6
1983	1,139.418	307	349,801	311,587	89.1
1984	1,145.653	307	351,715	299,832	85.2
1985	1,181.037	307	362,578	313,815	86.6
1986	1,170.525	307	359,351	326,316	90.8
1987	1,190.240	307	365,404	338,484	92.6

¹ Based on a 6-day workweek.

Sources: (49, p. 58; 87, p. 28; 99, p. 53; 168, p. 3; 169, p. 3; 170, p. 3; 171, p. 3).

Table 28—Monthly milling capacity, flour production, and use of potential capacity

Month	Actual daily capacity	Monthly milling days ¹	Potential monthly capacity	Monthly flour production	Annual capacity used
	<i>1,000 cwt</i>	<i>Number</i>	<i>----- 1,000 cwt-----</i>		<i>Percent</i>
1986:					
January	1,168	26	30,368	26,582	87.5
February	1,168	24	28,032	26,343	94.0
March	1,168	26	30,368	24,515	80.7
April	1,166	26	30,316	25,333	83.6
May	1,166	26	30,316	26,000	85.8
June	1,166	25	29,150	25,538	87.6
July	1,168	26	30,368	26,440	87.1
August	1,168	26	30,368	28,897	95.2
September	1,168	25	29,200	29,085	99.6
October	1,170	27	31,590	30,422	96.3
November	1,170	24	28,080	28,934	103.0
December	1,170	26	30,420	28,227	92.8
1987:					
January	1,180	26	30,680	26,020	84.8
February	1,180	24	28,320	26,363	93.1
March	1,180	26	30,680	27,723	90.4
April	1,179	26	30,654	26,683	87.0
May	1,179	25	29,475	28,932	98.2
June	1,179	26	30,654	28,461	92.8
July	1,187	26	30,862	27,384	88.7
August	1,187	26	30,862	29,538	95.7
September	1,187	25	29,675	29,067	98.0
October	1,190	27	32,130	31,068	96.7
November	1,190	24	28,560	29,539	103.4
December	1,190	26	30,940	27,706	89.5

¹ Based on a 6-day workweek.

Sources: (49, p. 60; 61, p. 36; 168, pp. 1, 2).

year. Industry observers indicate that the times at which margin differentials are greatest typically coincide with periods of peak protein premiums.

Price Competition

Changes in wheat product prices over time relative to changes in the general price level offer a measure of price competition. From 1972 to 1977, prices for nearly all flour products (except whole wheat flour) increased less than the gross national product (GNP) implicit price deflator (table 31). Between 1977 and 1982, the price of most wheat products increased at nearly the same level as the index. The one exceptional price rise involved 25-pound-or-larger bags of family flour, likely reflecting the large increase in institutional and fast-food outlet demand. The prices of certain specialty flours also accelerated substantially during this period.

Flour Quality and Baking Performance

Baking analysts contend that flour quality, when measured by baking performance, has dropped substantially in the past

25 years. Flour quality is one of the most pressing current issues in the milling and baking industries.

Baking analysts point to several factors substantiating the decline in flour quality and baking performance. National flour scores have declined precipitously since 1975 (table 32). In addition, fermentation tolerance has fallen, making the demands on the production process much more critical. For example, if a normal 4-hour fermentation time is extended to 4-1/2 to 5 hours because of mechanical difficulties, the probability of having a tolerable flour is much lower today than 10 years ago. Finally, the decrease in baking absorption has reduced the number of loaves of output per cwt of flour (10, pp. 2-3).

The American Bakers Association suggests that six factors have likely contributed to the change in flour quality (10, pp. 3-4):

- *Genetics*—Producers encouraged breeders to produce higher-yielding varieties that resisted disease. These efforts produced semi-dwarf varieties. But, attention to those factors that contribute to flour quality was not a priority in the breeding process.

Table 29—Wheat and flour price relationships at Kansas City

Marketing year ¹	Cost of wheat to produce 100 lb. of flour ²	Wholesale price of:			
		Bakery flour per 100 lb. ³	Byproducts obtained per 100 lb. flour ⁴	Total products ⁵	
				Actual	Over cost of wheat
<i>Dollars</i>					
1970/71	5.58	5.58	0.86	16.44	.86
1971/72	5.43	5.34	.74	6.08	.65
1972/73	7.13	6.78	1.11	7.89	.76
1973/74	10.58	10.36	1.60	11.96	1.38
1974/75	10.43	10.07	1.61	11.68	1.25
1975/76	9.43	9.23	1.56	10.79	1.36
1976/77	7.06	7.02	1.66	8.68	1.62
1977/78	6.56	6.76	1.26	8.02	1.46
1978/79	7.85	7.89	1.47	9.36	1.51
1979/80	9.85	10.02	1.70	11.72	1.87
1980/81	10.30	10.38	1.99	12.37	2.07
1981/82	9.81	10.37	1.57	11.94	2.13
1982/83	9.46	10.22	1.52	11.74	2.28
1983/84	9.45	9.99	1.83	11.82	2.37
1984/85	8.96	9.78	1.32	11.09	2.13
1985/86	8.28	9.28	1.20	10.47	2.20
1986/87	6.54	8.06	.84	8.90	2.36
1987/88	7.15	7.96	1.14	9.10	1.95

¹ June 1–May 31.

² Based on the average monthly cost of 2.28 bushels of No. 1 hard red winter, 13 percent protein, at Kansas City. Assumes a 73-percent extraction rate.

³ Quoted as mid-month bakers' standard patent, bulk basis.

⁴ Assumes a 50–50 millfeed distribution between bran and shorts or middlings, bulk basis.

⁵ Totals may not add due to rounding.

Sources: (151, p. 16; 152, p. 19; 153, p. 23; 154, p. 30; 155, p. 29; 156, p. 23).

Table 30—Wheat and flour price relationships at Minneapolis

Marketing year ¹	Cost of wheat to produce 100 lb. of flour ²	Wholesale price of:			
		Bakery flour per 100 lb. ³	Byproducts obtained per 100 lb. flour ⁴	Total products ⁵	
				Actual	Over cost of wheat
<i>Dollars</i>					
1970/71	5.92	6.27	0.85	7.12	1.20
1971/72	5.48	5.99	.71	6.70	1.22
1972/73	6.85	7.12	1.07	8.19	1.34
1973/74	10.48	10.67	1.56	12.23	1.75
1974/75	11.04	11.28	1.58	12.86	1.82
1975/76	10.04	10.39	1.51	11.90	1.86
1976/77	7.46	8.12	1.70	9.82	2.36
1977/78	6.73	7.49	1.20	8.69	1.96
1978/79	7.76	8.22	1.34	9.56	1.80
1979/80	9.73	10.26	1.51	11.77	2.04
1980/81	10.95	11.00	1.78	12.78	1.83
1981/82	9.80	10.67	1.41	12.08	2.28
1982/83	9.45	10.54	1.26	11.80	2.35
1983/84	9.80	10.75	1.59	12.34	2.54
1984/85	9.27	10.84	1.01	11.85	2.58
1985/86	9.05	11.39	.91	12.30	3.25
1986/87	6.99	9.22	.63	9.84	2.85
1987/88	7.18	9.39	.89	10.28	3.10

¹ June 1–May 31.

² Based on the average monthly cost of 2.28 bushels of No. 1 dark northern spring, 14 percent protein, at Minneapolis. Assumes a 73-percent extraction rate.

³ Quoted as mid-month spring standard patent, bulk basis.

⁴ Assumes a 50–50 millfeed distribution between bran and shorts or middlings, bulk basis.

⁵ Totals may not add due to rounding.

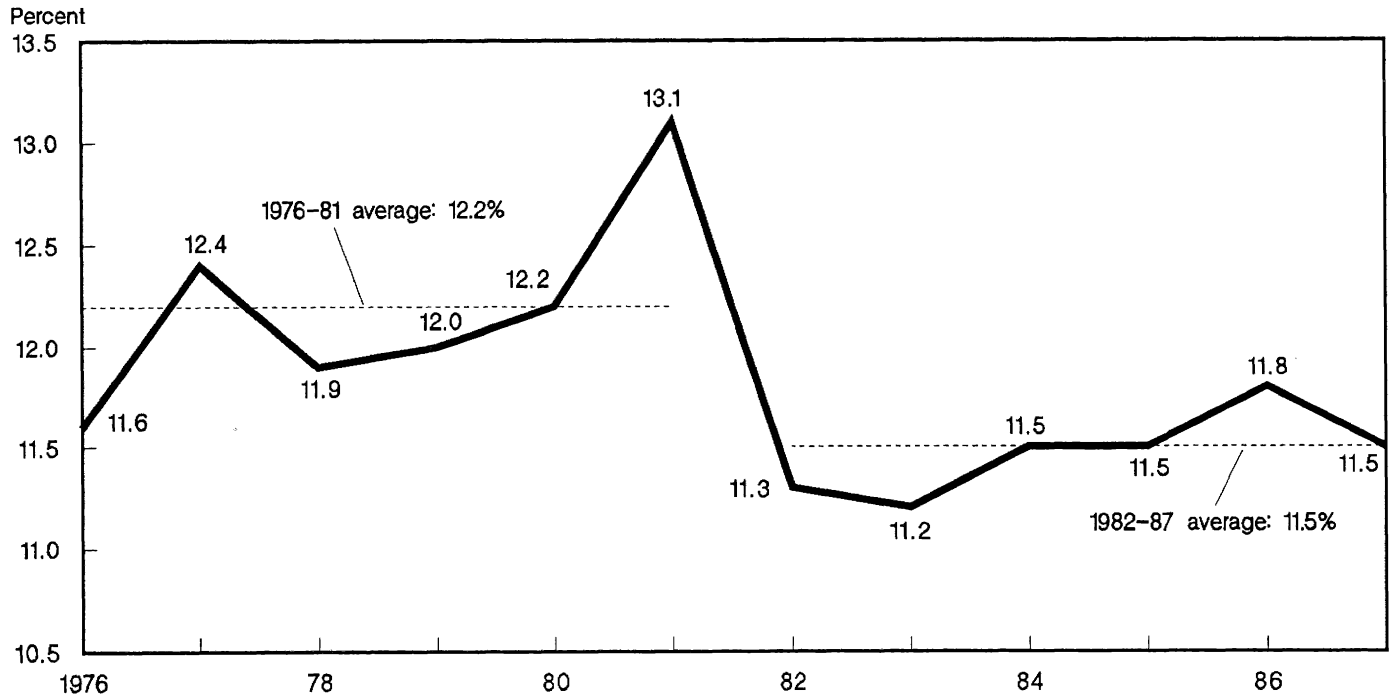
Sources: (151, p. 16; 152, p. 19; 153, p. 23; 154, p. 30; 155, p. 29; 156, p. 23).

- *Agronomics*—Increased irrigation and greater fertilization may have damaged flour quality.
- *Milling efficiencies*—Changes in milling practices, such as the changes in volume of wheat milled per square inch of bread roll, may have reduced flour quality. Also, the number of mill-sponsored bake labs has fallen.
- *Knowledge of baking quality*—Identity preservation and trading known lots of wheat are rare practices today. Some wheat going to mills may be of unknown baking quality.
- *Drop in protein content*—The decline in flour performance in the 1980's has occurred in conjunction with a decline in the average protein content of the wheat crop in the same period (fig. 3).
- *Proliferation of wheat varieties*—Wheat varieties that represented 85 percent of the acreage planted in Kansas in 1986 did not exist in 1977. The varieties planted in 1977 likely contained better baking characteristics.

Differences in the quality standards perceived by millers and bakers complicate the issue. The factors measuring wheat quality (test weight, protein, and dockage) and flour quality (ash content and protein) to millers are only weak indicators of flour performance to bakers. Instead of these factors, bakers focus on spread factor, texture, loaf volume, and other characteristics assuring consistent, high-quality products over time. Bakers ultimately determine quality by the value of the product to the consumer (10, p. 4).

The American Bakers Association asserts that solutions to the quality issue must emphasize better communication among grain handlers, millers, and bakers. Because no analytical tests exist to accurately predict flour performance, bakers must communicate observations on flour quality to millers. Millers then need to discuss the bakers' opinions with grain merchants. Finally, grain merchants must communicate to the farmer the needs and desires of the millers and bakers. If the price signal is transmitted through the wheat marketing system, this information can affect two things: the types of seeds producers purchase and, in turn, the characteristics breeders produce (10, pp. 4-5).

Figure 3
Kansas winter wheat protein content, 1976-87¹



1/ Twelve-percent moisture basis.

Selected Industry Statistics

Selected industry data indicate the influence of mill modernization and revitalization on industry performance. In the 1960's, the value of industry shipments changed very little, new capital expenditures were relatively low, and companies were rapidly exiting the industry. As mills began to modernize in the late 1960's and early 1970's, capital expenditures soared (table 33). At about the same time, domestic per-capita consumption of flour began to grow, and both the value added by manufacture and the value of shipments (real terms) began to rise.

Productivity gains appear to have accelerated even more rapidly between 1982 and 1986 (table 34). Value added per employee increased by 34 percent (real terms) between 1972 and 1977, for instance, but by 53 percent between 1982 and 1986. Value added per production-worker hour (real terms) rose by 42 percent between 1972 and 1977 and by 55 percent between 1982 and 1986. New capital expenditures per employee, however, have slackened somewhat.

As these data reveal, the rate of change in industry performance has quickened somewhat since 1977 as per-capita consumption continues to grow and mills increasingly adopt new technologies. In addition, costs have fallen. Material costs as a percentage of shipment value dropped from 78 percent in 1982 to 73 percent in 1986, and payroll as a percentage of value added fell from 30 percent in 1982 to 26 per-

cent in 1986. These changes partly reflect declining wheat prices in the mid-1980's. They also suggest that growing concentration may have led to greater procurement and processing efficiencies.

The Baking Industry

Wholesale bakers use flour from millers to produce breads, cakes, cookies, crackers, and pastries for retail sale. Both large, national companies, such as Nabisco, and small, family-owned firms own wholesale bakeries. Some wholesale bakeries sell baked goods to instore bakeries and restaurants; others focus on sales to specialty retail shops. Grocers sell many wholesale bakery products as prepackaged items. As consumers increasingly value their leisure time and do much less of their own baking, bakery sales, particularly from instore bakeries and retail shops, have expanded rapidly.

Industry Setting

The domestic wholesale baking industry represents the primary customer for wheat flour milled in the United States. According to recent census estimates, wholesale bakers directly use about 70 percent of all flour sold from domestic flour mills (table 35). Millers ship the remaining 30 percent to breakfast cereal producers, manufacturers of blended and

Table 31—Average price of principal flour and other grain mill products¹

Product	Size of package	1977 price per cwt	Percent increase, 1972-77	1982 price per cwt	Percent increase, 1977-82
		<i>Dollars</i>	<i>Percent</i>	<i>Dollars</i>	<i>Percent</i>
White flour:					
Export shipments—					
Commercial dollar exports	All sizes	7.56	26	10.08	33
All other ²	All sizes	6.83	3	10.28	51
Domestic shipments—					
Bakers' and institutional bread-type	Bulk container	7.52	26	10.24	36
		8.05	28	12.14	51
Bakers' and institutional soft-type	Bulk container	6.62	19	9.45	43
		7.36	19	10.95	49
Self-rising family flour	<25 lb.	11.96	20	17.87	49
	≥25 lb.	9.88	13	12.76	29
All other family flour ³	<25 lb.	10.79	14	15.31	42
	≥25 lb.	8.28	4	16.16	95
Shipments to blenders and processors ⁴	All sizes	7.24	21	9.26	28
Other than white flour:					
Whole wheat	All sizes	8.72	41	11.27	29
Durum flour and semolina	All sizes	7.91	23	10.91	38
Bulgur	All sizes	7.37	5	9.55	30
Other wheat flour	All sizes	7.45	20	12.09	62
1972 = 100					
GNP implicit price deflator	—	140.05	40	207.38	48

— = Not applicable.

¹ Average price based on quantity and value of shipments reported by the U.S. Department of Commerce, Bureau of the Census.² Includes P.L. 480 shipments.³ Includes phosphated, plain, bromated, enriched, and all-purpose.⁴ For further processing and/or packaging before resale or shipment in food products.⁵ Included with other wheat flour in 1972.

Sources: (14, p. 236; 177, p. 20D-21; 178, p. 20D-22).

prepared flours (who sell flour mixes to wholesale bakers), feed manufacturers, and a variety of other food processors and industrial concerns. Within wholesale baking, the bread and cake industry consumed over three times more wheat flour than did the cookie and cracker industry.

Both the bread and cake (SIC 2051) and cookie and cracker (SIC 2052) industries often use the same types of flour, but in quite different proportions (table 36). White bread-type flour accounts for a large share of all wheat flour consumed by the bread and cake industry, while cake-type and other flours are much less important. The cookie and cracker industry, in contrast, primarily consumes cookie- and cracker-type flour and uses white bread-type flour to a much lesser extent. Wheat flour purchases represented 32 percent of the value of all ingredients purchased by bread and cake wholesalers in 1982 and 20 percent of the value of all items purchased by cookie and cracker wholesalers (174, pp. 20E-16, 17).

Approximately 2,700 wholesale baking plants were operating in the United States in 1982. These plants typically specialize in the production of bread and cake items (2,305 plants) or cookie and cracker products (358 plants) (174,

Table 32—National flour scores¹

Bake performance	1975	1981	1984	1986	1987
<i>Percent</i>					
AA-10	2.4 ²	NA	NA	NA	NA
A-9	24.4	12.0	NA	NA	NA
A-8	53.0	70.6	24.5	1.8	.2
A-7	16.0	12.0	58.5	52.9	48.5
B-6	2.4	4.2	15.4	39.9	34.5
B-5	.9	1.2	1.6	4.6	14.8
B-4	.4	NA	NA	.6	1.7
C-3	.5	NA	NA	.2	.3
C-2	NA	NA	NA	NA	NA
C-1	NA	NA	NA	NA	NA

NA = Not available.

¹ Flour score is a measure of flour quality obtained from controlled laboratory tests.² Values summarize grain and texture scores and flour tolerance at different mixing variations, as reported by two dozen U.S. mills.

Source: (10, p. 2).

p. 20E-4). Few plants produce items that can be classified in both the bread and cake industry and the cookie and cracker industry. Within these major categories, most plants manufacture only a few distinct items, such as breads and



Fresh-baked loaves roll off a production line.

rolls or sweet goods, although certain large plants produce a wide variety of baked goods (130, pp. 31-105, 120-136).

Perishability is the primary reason for the difference in plant numbers between the two industries. Because bread-type products are more perishable than cookies and crackers, the number of establishments in the bread and cake industry remains larger and the industry is more local. Over one-half of all bread and cake plants operating in 1982, for instance, hired fewer than 20 employees (174, p. 20E-10). With limited access to capital, many of these bakeries constitute single-plant, family-owned operations serving specific market niches. They typically find that the costs of refrigerated shipment and potential product deterioration outweigh the gains from expanding their geographic distribution.

Better able to bear additional costs and risks, the larger, multiple-unit bread and cake operations have developed regional markets. The largest firms may operate regionally throughout the Nation or in only one region (tables 37 and 38). Continental Baking, the largest bread and cake wholesaler in 1986, operates on a nationwide scale. In contrast, Flowers Industries, the fifth largest bread and cake company, sells bread and cake products only in the Southeast. For companies ranking below the top eight in sales volume, the regional focus is typically much narrower.

For large cookie and cracker manufacturers, the economies associated with long production runs surpass the advantages of plant dispersion and reduced transport costs. As a result, the large cookie and cracker companies have fewer plants and a more national focus than the large bread and cake companies (tables 39 and 40). For example, Nabisco receives at least 15 percent of its annual sales from each U.S. geographic region. At the same time, the Northeast, Midwest, and West each contribute about 20 percent to Sunshine's total

sales. Every large cookie and cracker wholesaler, except Interbake, distributes products to all U.S. regions.

Operating and ownership structures vary substantially among wholesale baking companies. Some wholesale baking companies are single-unit enterprises, while others form part of a highly integrated, multiple-unit structure. Wholesale bakeries generally fall into four classes:

- Multiunit wholesale bakeries with diversification into other processing and commodity operations and having interregional or national brand identities (Nabisco).
- Captive bakeries owned by supermarket chains and producing the chain's private label goods and items for their instore bakeries (Safeway, Winn-Dixie, Kroger).
- Bakery manufacturers serving regional markets and frequently marketing private label goods to retail grocers, their own private label lines, and fresh-baked goods for retail sale (Metz Baking, McGlynn Bakeries).
- Small single-unit bakeries that produce specialty items for specific market segments.

Overall, wholesale plants without supermarket affiliation outnumber those owned by supermarket chain bakeries. Of the 2,305 U.S. bread and cake plants in 1982, for instance, only 94 were identified as supermarket chain bakeries. The remaining 2,211 plants were classified as single-plant or multi-plant wholesalers or retail multi-outlet bakeries (174, pp. 20E-6, 7).

Three cooperative associations (American Bakeries Coop., Inc.; the W.E. Long Company—Independent Bakers' Coop.; and Quality Bakers of America Coop., Inc.) assist member bakeries in business strategy and management, conduct research and development for member firms, promote efficiency in production and engineering, and help members market their products. The economies of joint research can also lower individual member costs, helping members better compete with the large, regional bakers. By representing nationally recognized brand names, cooperatives also can achieve a substantial degree of market power. The Sunbeam line, for example, marketed by Quality Bakers of America, affords member firms a significant degree of brand recognition for their product (119). In total, 82 baking companies were members of one or more of the industry's three cooperative associations in 1987 (130, p. 28).

Trends In Consumption and Supply

The consumption of wholesale baked goods has, on average, declined in the 1980's (see "Domestic Consumption of

Table 33—Historical statistics for the flour and other grain mill products industry

Item	Unit of measure	1972	1977	1982	1986
Companies	Number	340	301	251	NA
All establishments:					
Total	Number	457	407	360	NA
With 20 or more employees	Number	181	173	174	NA
All employees:					
Number	Thousands	16.1	15.6	15.1	13.5
Payroll (current)	Million dollars	153	222	323	349
Payroll (real) ¹	do.	275	320	323	388
Production workers:					
Number	Thousands	11.9	11.3	11.4	9.9
Hours	Millions	26.9	24.6	24.2	21.4
Wages (current)	Million dollars	108	153	233	241
Wages (real)	do.	194	220	233	268
Value added (current)	do.	510	825	1,094	1,346
Value added (real)	do.	917	1,189	1,094	1,496
Cost of materials (current)	do.	1,885	2,854	3,826	3,643
Cost of materials (real)	do.	3,390	4,112	3,826	4,048
Value of industry shipments (current)	do.	2,380	3,683	4,933	5,003
Value of industry shipments (real)	do.	4,281	5,307	4,933	5,559
New capital expenditures (current)	do.	30	52	91	63
New capital expenditures (real)	do.	54	75	91	70
End-of-year inventory (current)	do.	211	263	362	319
End-of-year inventory (real)	do.	379	379	362	354
Specialization ratio ²	Percent	97	98	97	NA
Coverage ratio ³	do.	74	71	70	NA

NA = Not available.

¹ Real values are expressed in 1982 dollars. The value of industry shipments deflator constructed by the U.S. Department of Commerce is used to express current dollars in real dollars.

² Ratio of primary product shipments to total primary and secondary product shipments in the grain mill product industry.

³ Ratio of primary products shipped by the establishments classified in the industry to the total shipments of such products shipped by all manufacturing establishments, wherever classified.

Sources: (177, pp. 20D-2, 6; 185).

Baked Goods" section). At the same time, per-capita flour consumption and sales from instore bakeries and retail outlets have accelerated. To gain a larger share of the baked goods market, many bakery wholesalers are aggressively developing new products and expanding their promotional base. Many industry analysts contend that instore bakeries and retail outlets constitute a substantial threat to prepackaged sales. Instore bakery purchases are, however, often made on impulse and may not in the long run steal the market share from wholesalers that some observers expect.⁷

⁷ Federal Government data capturing instore bakery quantities and sales do not exist. If instore products are produced where they are sold, sales are captured under the food retailing sections of the monthly and annual surveys of retail sales. If the items are produced at other locations and shipped to instore bakeries, the quantities are included in wholesale data reported by the U.S. Department of Commerce. (See "Data Sources.")

Domestic Consumption of Baked Goods

Although wholesale bakery sales grew from \$20.2 billion in 1983 to about \$26 billion in 1987, consumption of wholesale baked goods appears to have reached a plateau (117, p. 31; 192, p. 80). Per-capita consumption of wholesale baked goods (breads, cakes, cookies, and crackers) declined from 90.72 pounds in 1982, for instance, to 89.51 pounds in 1987 (tables 41 and 42). Consumption of wholesale items has dropped in nearly all categories, with rolls, pies, and cake-type doughnuts registering the largest losses. Consumption rose in several categories, including variety breads, certain sweet yeast goods, and certain cookies and crackers, but not enough to boost average per-capita disappearance (129, pp. 45-46).

Overall, the value of wholesale baked goods shipments rose 24 percent between 1982 and 1987 (tables 43 and 44). Domestic consumption of highly valued products (cookies,

Table 34—Selected operating ratios for the flour and other grain mill products industry

Item ¹	Unit of measure	1972	1977	1982	1986
Payroll per employee (current)	Dollars	9,491	14,250	21,391	25,830
Payroll per employee (real) ²	do.	17,070	20,533	21,391	28,700
Production workers as percent of employment	Percent	74	72	75	73
Annual hours per production worker	Hours	2,261	2,177	2,123	2,162
Average hourly earnings of production workers (current)	Dollars	4.02	6.24	9.64	11.28
Average hourly earnings of production workers (real)	do.	7.23	8.99	9.64	12.53
Materials cost as percent of shipment value	Percent	79	77	78	73
Materials and payroll as percent of shipment value	do.	86	84	84	80
Value added/employee (current)	Dollars	31,665	52,853	72,470	99,704
Value added/employee (real)	do.	56,951	76,157	72,470	110,782
Payroll as percent of value added	Percent	30	27	30	26
Value added per production worker hour (current)	Dollars	18.95	33.52	45.22	62.90
Value added per production worker hour (real)	do.	34.09	48.29	45.22	69.89
New capital expenditure per employee (current)	do.	1,863	3,359	6,000	4,652
New capital expenditure per employee (real)	do.	3,351	4,840	6,000	5,169

¹ Independent rounding may cause values to differ from those calculated from table 33.

² Real values are expressed in 1982 dollars. The value of industry shipments deflator constructed by the U.S. Department of Commerce is used to express current dollars in real dollars.

Sources: (177, p. 20D-8; 185).

certain crackers, variety breads, and certain sweet goods) increased most rapidly over this time period, while consumption declined among items that are of typically lesser value (white bread, rolls, doughnuts). Prices increased moderately in most categories (see "Wholesale and Retail Baked Goods Prices" section).

The upward trend in per-capita flour consumption appears to depend heavily on consumers' desire for convenience, service, and variety. Many consumers are increasingly purchasing ready-baked foods from instore bakeries and retail outlets rather than using scarce leisure time to prepare food from scratch. Baked goods sold in individually wrapped, single servings are also growing in popularity (51, pp. 27-36). Consumers have been particularly drawn to supermarkets that offer a wide diversity of choices in baked goods, ranging from variety at the instore bakery, many of which offer over 100 different items, to additional items available on the shelf and in the freezer case (53, pp. 29-38).

Although little information on instore bakery and retail consumption of baked goods is published, several factors point to the growing interest that consumers have in these outlets. The number of instore units rose from 13,800 in 1982 to 18,850 in 1987, an increase of 37 percent (31, p. 5A; 32, p. 8A; 68; 78). Purchases from instore bakeries totaled \$4.8 billion in 1987, up 9 percent from \$4.4 billion in 1986 (32, p. 8A). Retail bakery sales (from such outlets as T.J.

Cinnamon's and Mrs. Field's) jumped from \$3.8 billion in 1983 to over \$5 billion in 1987 (30, p. 90).

The Bureau of Labor Statistics diary survey, an ongoing study of consumer purchase patterns, provides additional information about consumer preferences. According to this survey, per-capita spending on baked goods increased about 20 percent between 1980 and 1984 (table 45).⁸ Over this period, expenditures accelerated most rapidly for cookies (registering a 43-percent increase in spending); breads other than white bread (36 percent); cakes and cupcakes (25 percent); crackers (25 percent); and fresh biscuits, rolls, and muffins (23 percent). In contrast, the increase in spending on white bread, one of the staples of the wholesale trade, has lagged far behind (138, pp. 99-111; 139, pp. 75-91).⁹

The diary survey also provides information about demographic variations in baked goods spending (122, pp. 14-19).¹⁰ Spending in the Northeast, at \$1.53 per person in 1984, leads all other U.S. regions. Meanwhile, baked foods spending in the Midwest and "other urban" areas grew the

⁸ Because of the survey design, an increase in spending may reflect increases in price, increases in purchased quantities, or the combined influence of both factors.

⁹ For additional information on consumer spending, see 138, pp. 99-111, and 139, pp. 75-91.

¹⁰ Demographic differences in flour consumption are also examined in 122, pp. 14-19.

most between 1982 and 1984 (table 46). Spending for baked foods is highest in consumer units where the head of the household is over 64 years of age (table 47). For most income levels, baked food spending appears to increase with income (table 48).

Changing demographics may soon alter trends in baked goods spending and consumption (59, pp. 30-44). Consumers over age 65 (who tend to favor white bread) represent a growing share of the population (184, pp. 39-24). Consumption of nontraditional food service items, including roll-type items such as bagels and croissants, is expected to increase in the early 1990's as the population grows more mobile. Per-capita cracker consumption is expected to grow as companies more aggressively target new products to 25- to 49-year olds (183, pp. 42-22, 23). Commercialization of new sweeteners for baked goods may stimulate cookie consumption among certain adults (182, p. 39-17).

Exports and Imports of Baked Goods

Varied tastes, foreign production, and product perishability constrain world trade in baked goods. As a result, the sum of U.S. imports and exports has typically accounted for less than 2 percent of the total value of domestic bakery shipments in the United States during the 1970's and 1980's (table 49). Because they are much less perishable than breads and cakes, cookies and crackers have historically generated two-thirds to three-fourths of total U.S. exports (182, p. 39-15; 183, p. 42-20; 185).

After declining in the mid-1980's, the value of U.S. bakery exports (1982 dollars) has turned upward.¹¹ For instance, the real value of U.S. bakery exports jumped from \$36 million in 1986 to \$42 million in 1987, an increase of 17 percent (table 49). Export sales were expected to increase another 19 percent in real terms between 1987 and 1988 alone. The level of U.S. bakery exports depends quite heavily, however, on exchange rates. A weakened U.S. dollar, for example, helped propel the value of exports to Japan by over one-third in 1987. Approximately 81 percent of 1987 U.S. bakery export sales were destined for Canada, the Bahamas, Japan, Saudi Arabia, and Panama (183, p. 42-22).

In contrast to the export scenario, the pace of U.S. bakery imports (1982 dollars) has been slowing in the 1980's. The yearly increase in import value in the early 1980's often approached 20 percent. But the real value of total imports in 1987 was estimated at about \$265 million, up from \$243 million in 1986, a yearly increase of only 9 percent (table 49).

¹¹ Because the value of exports is deflated by an index of U.S. bakery prices, an increase in value mainly captures increases in shipment quantities rather than increases in price. Deflating values in this way assumes, though, that prices in importing nations are increasing at the same rate as U.S. bakery prices.



As consumers increasingly value their leisure time and do much less of their own baking, sales of bakery items such as cookies and pastries have grown rapidly.

Table 35—Use of flour by primary flour-using industries, 1982

Industry	SIC code ¹	Flour use 1,000 cwt
Wholesale baking:		
Bread, cake, and related products	2051	100,062
Cookie and cracker	2052	30,158
Flour and other grain mill products	2041	8,018
Cereal breakfast foods	2043	3,577
Blended and prepared flour	2045	12,163
Feed manufacturing:		
Dog, cat, and other pet foods	2047	3,110
Other prepared feeds	2048	3,380
Canned specialties	2032	1,536
Frozen specialties	2038	8,264
Macaroni and spaghetti	2098	17,069
Total	—	187,337

— = Not applicable.

¹ SIC codes are designations under the Standard Industrial Classification system.

Sources: (74, pp. 20E-16, 17; 177, pp. 20D-31, 32; 180, pp. 20I-25, 26; 181, pp. 20C-26, 27).

Import value is expected to have fallen 4 percent between 1987 and 1988.

As with exports, changes in exchange rates greatly influence import values. Changes in the unit values of imported goods from Denmark dropped by 4 percent between 1986 and 1987, for instance, while the values of bakery products imported from Germany rose nearly 36 percent. Over two-thirds of U.S. cookie and cracker imports were shipped from Canada, Denmark, Japan, Germany, and the United Kingdom in 1987 (183, p. 42-22).

Table 36—Use of different types of flour by the baking industries, 1982

Flours and mixes	Industry	
	Bread, cake, and related products	Cookie and cracker
<i>1,000 cwt</i>		
Flour types:		
White bread	86,927	2,332
Cake	3,485	957
Cookie and cracker	501	25,435
Wheat gluten	1,105	20
Other ¹	8,044	1,414
Total	100,062	30,158
Prepared mixes:		
Doughnut, cake, and yeast	2,401	*
Bread ²	635	*
Cake	110	*
Other prepared mixes ³	788	*
Total	3,934	*

* = U.S. Department of Commerce, Bureau of the Census does not collect information or information is withheld to avoid disclosing individual company data.

¹ Includes whole wheat, cracked wheat, and clear flour but excludes prepared mixes.

² Includes franchise mixes.

³ Includes mixes for sweet goods.

Source: (174, p. 20E-16).

Table 37—Geographic sales base of the largest bread and cake companies, 1986

Company ¹	Sales	Plants	Employees
	<i>Million dollars</i>	<i>---- Number ----</i>	
Continental Baking Co. ²	1,662	47	22,400
Campbell-Taggart, Inc.	1,100 ³	59	19,000
Interstate Bakeries Corp.	708	27	11,200
Entenmann's, Inc. ⁴	651	11	7,229
Flowers Industries	622 ³	30	10,000
American Bakeries Co.	444	16	6,118
The Kroger Co.	383 ³	10	2,000
Safeway Stores, Bakery Division	355 ³	13	1,300

¹ Information provided by industry analysts was used to determine companies primarily engaged in the bread and cake industries.

² Includes acquisition of Drake Baking Company.

³ Estimated sales.

⁴ Owned by General Foods.

Source: (8, p. 88).

Supplies of Bakery Products

The real value of wholesale bakery supplies (the sum of domestic shipments and imports) appears to have remained nearly the same throughout the 1970's and 1980's (table 49).

For example, the value of total supplies was \$16 billion in 1975 and was estimated to be \$16.5 billion in 1988, which is only a slight increase in this 13-year period. However, the real value of supply has increased almost consistently in the 1980's.

Structure of the Baking Industry

The structure of the domestic baking industry is changing rapidly. Many of the largest wholesale baking companies, such as Nabisco and Campbell-Taggart, were acquired by diversified agricultural companies, including R.J. Reynolds and Anheuser-Busch, in the early to mid-1980's. These acquisitions have linked the baking industry more closely to other food processing activities. They have also expanded the marketing strength and capital base of the baking industry. At the same time, small bakeries have been leaving the industry, and sales concentration among the large wholesale bakers has been increasing, although not as rapidly as in the milling industry.

Bakery Plant Numbers and Locations

The number of plants in the wholesale baking industry is rapidly changing. A large number of small bread and cake plants are disappearing, for instance, because they cannot effectively compete with their larger counterparts. In contrast, the number of cookie and cracker plants is expanding as specialty suppliers enter the market.

Bread and Cake Plants. The number of bread and cake plants has dropped sharply in the past 20 years. Between 1972 and 1982, for example, the number of bread and cake plants declined from 3,323 to 2,305, a drop of over 30 percent (table 50). Plants with fewer than 20 employees have closed at the most rapid pace. Plant numbers resurged between 1977 and 1982 for those plants with 20-49 employees, the only size category in which any noticeable

Table 38—Regional contribution to sales of the largest bread and cake companies, 1986

Company	Northeast	Southeast	Midwest	Southwest	West
	<i>Percent</i>				
Continental Baking Co. ¹	13	12	45	5	25
Campbell-Taggart, Inc.	0	45	15	25	15
Interstate Bakeries Corp.	7	11	51	0	31
Entenmann's, Inc. ²	40	8	14	4	34
Flowers Industries	0	100	0	0	0
American Bakeries Co.	27	56	17	0	0
The Kroger Co.	NA	NA	NA	NA	NA
Safeway Stores, Bakery Division	15	0	5	20	60

NA = Not available.

¹ Includes acquisition of Drake Baking Company.

² Owned by General Foods.

Source: (8, p. 88).

Table 39—Geographic sales base of the largest cookie and cracker companies, 1986

Company ¹	Sales	Plants	Employees
	<i>Million dollars</i>	<i>---- Number ----</i>	
Nabisco Brands USA, Biscuit Division	1,800 ²	12	9,500
Keebler Co.	1,005	9	8,251
Sunshine Biscuits, Inc.	511	8	5,000
General Biscuit Brands, Inc.	130	2	1,500
Archway Cookies	120	8 ³	900
Interbake Foods, Inc.	106 ²	4	1,500

¹ Information provided by industry analysts was used to determine companies primarily engaged in the cookie and cracker industries.

² Estimated sales.

³ Two company-owned plants and six independent plants under license agreement.

Source: (8, p. 88).

increase has been recently recorded. Firms in this size category likely represent bakers concentrating on narrow market niches, an area that has been rapidly expanding (101, p. 44).

Many of these plant closings and consolidations involve company restructurings. A number of large companies are shutting plants to improve company efficiency and reduce maintenance and energy costs. For instance, both Campbell-Taggart and Continental Baking have converted bakeries into warehouses. By consolidating operations and expanding plant capacities at selected locations, these companies can often increase their cost-competitiveness. At the same time, many small, inefficient companies are leaving the industry.

These changes have affected the market share held by firms of different sizes. The market share (measured by value of shipments) held by firms employing fewer than 100 employees, for instance, fell from 19 percent in 1972 to 14

percent in 1982 (table 50). Over the same time period, the market share held by plants employing 100 workers or more, those that are most often involved in consolidation operations, increased from 81 to 86 percent.

Although changes in plant numbers have shifted the geographic distribution of plants, the 2,305 U.S. bread and cake plants in 1982 were scattered across nearly all 50 States. Those States with the largest number of bread and cake plants include New York (288), California (273), and Pennsylvania (160) (174, pp. 20E-5, 6). Pockets of bakery activity often cluster around such major metropolitan areas as New York City, Chicago, and Los Angeles (130, pp. 31-105). Because bread and cake products are highly perishable, few plants operate in the low-population States of Idaho, South Dakota, and Vermont (174, pp. 20E-5, 6).

Fewer bread and cake plants are found in the 1980's in nearly all regions than in the 1970's (table 51). Between 1972 and 1982, plant numbers in the East and West North Central States declined, respectively, by 45 percent and 46 percent. Numbers in the New England and Middle Atlantic States dropped by about 35 percent over the same period. Plant numbers did not increase in any region, although numbers in the Pacific region remained constant.

Cookie and Cracker Plants. Unlike in the bread and cake industry, plant numbers in the cookie and cracker industry have been rising. The number of cookie and cracker plants jumped from 315 in 1972 to 358 in 1982, an increase of 14 percent (table 52). The number of plants with between 1-19 and 500-999 employees rose most rapidly, each increasing by about 25 percent between 1972 and 1982. Plant numbers in all other size categories remained relatively constant.

Several factors may account for the increasing number of cookie and cracker plants. A number of small, specialty companies hiring fewer than 20 employees have entered the industry (54, p. 24). In addition, with a relatively low

Table 40—Regional contribution to sales of the largest cookie and cracker companies, 1986

Company	Northeast	Southeast	Midwest	Southwest	West
<i>Percent</i>					
Nabisco Brands USA, Biscuit Division	20	15	30	15	20
Keebler Co.	18	19	50	6	7
Sunshine Biscuits, Inc. ¹	23	13	18	7	22
General Biscuit Brands, Inc.	14	13	47	13	13
Archway Cookies	20	10	50	10	10
Interbake Foods, Inc.	20	10	30	0	40

¹ 17 percent of Sunshine's sales were in Canada.

Source: (8, p. 88).

Table 41—Per-capita consumption of bread and related products

Product	1982	1983	1984	1985	1986 ¹	1987 ¹
<i>Pounds per person</i>						
All breads	46.16	45.70	46.07	45.54	45.26	45.22
White pan	27.63	27.44	27.25	26.82	26.56	26.48
Unspecified	2.53	2.37	2.27	2.14	2.06	1.96
Variety types	16.00	15.89	16.55	16.58	16.64	16.78
Hearth	3.96	3.93	4.11	4.07	4.08	4.11
Whole and cracked wheat	8.43	8.37	8.79	8.89	8.95	9.18
Rye	1.65	1.64	1.68	1.66	1.66	1.65
All other	1.96	1.95	1.97	1.96	1.95	1.84
Rolls	14.10	13.86	13.94	13.47	13.30	13.02
Hamburger and hot dog	11.72	11.52	11.57	11.12	10.96	10.81
Brown and serve	1.20	1.18	1.19	1.19	1.18	1.11
Hearth	1.18	1.16	1.18	1.16	1.16	1.10
Sweet yeast goods	3.39	3.54	3.67	3.52	3.53	3.54
Doughnuts	.60	.64	.62	.58	.57	.58
All other ²	2.79	2.90	3.05	2.94	2.96	2.96
Soft cakes	5.54	5.24	5.46	5.34	5.31	5.28
Snack cakes	3.84	3.66	3.94	3.90	3.90	3.88
All other	1.70	1.58	1.52	1.44	1.41	1.40
Pies	2.13	1.98	2.01	1.98	1.95	1.94
Snack pies	1.21	1.13	1.14	1.13	1.11	1.11
All other	.92	.85	.87	.85	.84	.83
Cake-type doughnuts	1.92	1.78	1.80	1.79	1.76	1.75
Total	73.24	72.10	72.95	71.64	71.11	70.75

¹ Estimated by the U.S. Department of Commerce, International Trade Administration.

² Includes coffee cakes and other items.

Source: (183, p. 42-21).

number of plants in the industry, many manufacturers may have found that building specialized plants near growing consumption areas is more efficient than expanding existing facilities. By building new plants, they can reduce the transportation costs of moving products long distances and can react more quickly to shifts in product demand.

These changes in the industry have affected the market share held by plants of different sizes (table 52). When measured by value of shipments, the market share held by firms employing 500-999 workers has increased from 39

to 45 percent between 1972 and 1982. The market share held by firms with fewer than 500 employees has fallen, while market share has dropped most dramatically, from 29 to 26 percent, for firms hiring 1,000 or more employees.

The 358 U.S. cookie and cracker plants in 1982 were located in 27 States (174, p. 20E-7). Those States with the largest plant numbers include California (47), Pennsylvania (45), and New York (41). Plants cluster near the Chicago, New York City, and Los Angeles markets (130, pp.120-136).

Table 42—Per-capita consumption of cookies and crackers

Product	1982	1983	1984	1985	1986	1987 ¹
<i>Pounds per person</i>						
Cookies	9.57	9.48	10.05	10.17	10.64	10.90
Sandwich	2.57	2.54	2.69	2.72	2.85	2.93
Marshmallow	.37	.37	.39	.40	.41	.43
Wafer ²	.24	.24	.25	.26	.27	.27
All other	6.39	6.33	6.72	6.79	7.11	7.27
Crackers	7.91	7.86	7.87	7.76	7.86	7.86
Graham	.78	.77	.77	.76	.77	.79
Saltines	2.55	2.55	2.54	2.50	2.54	2.61
Cracker sandwiches	.50	.49	.50	.49	.50	.51
Cracker meal and crumbs	.17	.17	.17	.17	.17	.16
Pretzels	.80	.80	.79	.78	.77	.75
Other crackers	3.11	3.08	3.10	3.06	3.11	3.04
Total	17.48	17.34	17.92	17.93	18.50	18.76

¹ Estimated by the U.S. Department of Commerce, International Trade Administration.² For ice cream sandwiches.

Source: (I83, p. 42-21).

Table 43—Shipment value of bread and related products

Product	1982	1983	1984	1985	1986	1987 ¹
<i>Million dollars</i>						
All breads ²	4,698	4,898	4,991	5,124	5,295	5,413
White pan	2,617	2,729	2,780	2,855	2,950	3,014
Variety types	1,859	1,938	1,975	2,027	2,095	2,144
Unspecified kinds	222	231	236	242	250	255
Rolls, bread stuffing, and bread crumbs ³	2,438	2,518	2,503	2,685	2,951	3,006
Sweet yeast goods ⁴	761	845	851	857	829	837
Soft cakes ⁴	1,231	1,232	1,278	1,419	1,519	1,552
Pies ⁴	394	387	373	378	344	348
Pastries	39	37	34	36	46	50
Cake-type doughnuts	465	454	474	481	521	524
Unspecified products	1,001	1,125	1,220	1,133	1,162	1,186
Total ²	11,027	11,498	11,724	12,113	12,667	12,917

¹ Estimated by the U.S. Department of Commerce, International Trade Administration.² Totals may not add due to rounding.³ Includes frozen items.⁴ Excludes frozen items.

Sources: (I82, p. 39-16; I83, p. 42-21).

Table 44—Shipment value of cookies and crackers

Product	1982	1983	1984	1985	1986	1987 ¹
<i>Million dollars</i>						
Cookies and related items	2,481	2,592	2,882	3,288	3,265	3,459
Crackers and similar products	1,828	2,031	2,389	2,742	2,426	2,562
Unspecified cookies and crackers	127	136	172	207	202	211
Total ²	4,436	4,759	5,443	6,237	5,894	6,233

¹ Estimated by the U.S. Department of Commerce, International Trade Administration.² Totals may not add due to rounding.

Sources: (I82, p. 39-16; I83, p. 42-22).

Table 45—Average weekly expenditures per capita on bakery products in urban households

Item	1980	1981	1982	1983	1984
<i>Dollars per week</i>					
White bread	0.30	0.30	0.34	0.32	0.31
Other bread	.11	.14	.14	.15	.15
Fresh biscuits, rolls, and muffins	.13	.13	.15	.15	.16
Cakes and cupcakes	.12	.12	.12	.13	.15
Cookies	.14	.15	.17	.17	.20
Crackers	.08	.09	.09	.09	.10
Bread and cracker products	.02	.02	.02	.02	.02
Doughnuts and sweet rolls	.12	.12	.15	.12	.13
Frozen and refrigerated baked goods	.07	.07	.08	.06	.08
Fresh pies, tarts, and turnovers	.04	.03	.04	.04	.04
Total ¹	1.12	1.16	1.29	1.25	1.34

¹ Totals may not add due to rounding.

Source: (I25, p. 13).

Table 46—Average weekly expenditures per capita on bakery products in urban households by region

Standard Metropolitan Statistical Area	1982	1983	1984	Change, 1982-84
<i>--- Dollars per week ---</i>				<i>Percent</i>
Northeast	1.45	1.44	1.53	5.5
Midwest	1.30	1.27	1.40	7.7
South	1.16	1.14	1.19	2.6
West	1.34	1.23	1.32	-1.5
Other urban	1.15	1.13	1.25	8.7
All	1.29	1.25	1.34	3.9

Source: (I25, pp. 52, 55, 58).

Table 47—Average weekly expenditures per capita on bakery products in urban households by householder's age

Householder's age and status	1982	1983	1984	Change, 1982-84
<i>--- Dollars per week ---</i>				<i>Percent</i>
Under 25				
Nonstudent	0.88	0.90	1.03	17.0
Student	.37	.30	.26	-29.7
25-34	1.09	1.04	1.11	1.8
35-44	1.25	1.25	1.20	-4.0
45-54	1.40	1.41	1.49	6.4
55-64	1.66	1.48	1.69	1.8
Over 64	1.51	1.50	1.73	14.6
All	1.29	1.25	1.34	3.9

Source: (I25, pp. 160, 163, 166).

Table 48—Average weekly expenditures per capita on bakery products in urban households by income class

Income class	1982	1983	1984	Change, 1982-84
<i>--- Dollars per week ---</i>				<i>Percent</i>
Under \$5,000	1.01	0.91	1.20	18.8
\$5,000-\$9,999	1.10	1.15	1.14	3.6
\$10,000-\$14,999	1.18	1.14	1.26	6.8
\$15,000-\$19,999	1.26	1.22	1.31	4.0
\$20,000-\$29,999	1.36	1.31	1.40	2.9
\$30,000-\$39,999	1.45	1.40	1.42	-2.1
\$40,000 and over	1.61	1.45	1.61	0
All	1.29	1.25	1.34	3.9

Source: (I25, pp. 124, 127, 130).

In contrast, relatively few cookie and cracker plants operate in New England or the Great Plains (I74, p. 20E-7).

The growth in overall cookie and cracker plant numbers reflects more plants in the New England, Middle Atlantic, East North Central, South Atlantic, and Pacific regions (table 53). Plant numbers in the South Atlantic region, for instance, increased by 78 percent between 1972 and 1982. Over the same period, the number of plants in the East North Central and Pacific regions rose, respectively, by 23 and 31 percent. In contrast, plant numbers in the East South Central region plummeted by 50 percent, while plant numbers declined 57 percent in the Mountain States.

Acquisitions and Ownership Changes

The ownership structure of noncaptive wholesale baking companies, whether they own bread, cake, cookie, or cracker plants, has evolved significantly in the past 30 years as agribusiness firms with no prior baking experience have acquired baking companies. Within this period, the ownership of every major wholesaler, except Flowers Industries, has changed (92, pp. 26, 29). Many of these changes have occurred since 1982. Anheuser-Busch Companies, Inc., bought Campbell-Taggart, Inc., in 1982. Ralston-Purina Company purchased Continental Baking Company in 1984 (I09, p. 51). Nabisco Brands merged with R.J. Reynolds in 1985. When measured by sales volume, a majority of the largest baking wholesalers in 1987 were held by such diversified companies.

These new companies have enhanced the financial, marketing, and management resources of the baking industry. Because of their large asset base, they can channel capital into new product development and new technology and can engage in the advertising necessary for establishing and maintaining brand loyalty. They have developed extensive expertise in building consumer brand identification at a time when "old line" baking companies often have continued to focus on selling to grocery stores, not to consumers. The

Table 49—Real value of bakery product shipments and trade¹

Year	Shipments	Imports	Supply	Exports	Domestic use
<i>Million real dollars</i>					
1975	15,916	87	16,003	32	15,971
1976	16,416	94	16,510	33	16,477
1977	15,901	95	15,996	39	15,957
1978	15,493	118	15,611	41	15,570
1979	15,596	113	15,709	39	15,670
1980	15,402	123	15,525	40	15,485
1981	15,205	118	15,323	44	15,279
1982	15,464	142	15,606	45	15,561
1983	15,671	150	15,821	45	15,776
1984	15,832	178	16,010	43	15,967
1985	16,118	215	16,333	40	16,293
1986	15,906	243	16,149	36	16,113
1987 ²	16,136	265	16,401	42	16,359
1988 ³	16,224	254	16,478	50	16,428

¹ Real values are expressed in 1982 dollars. The value of bakery product shipments deflator constructed by the U.S. Department of Commerce is used to express current dollars in real dollars.

² Estimated except for imports and exports.

³ Estimated.

Sources: (182, p. 39-15; 185).

packaging and product innovation strengths of the newly formed companies have accelerated the pace of new item introductions (18, pp. 23-33).

The extensive capital base of these large, integrated companies provides them not only with marketing advantages but may also afford cost advantages (121, pp. 81-84). Because of their already sizable commodity shipments, they may be able to negotiate lower rail and truck rates than smaller firms. They can use established information-gathering methods. They may also be able to lower the unit costs of accounting and legal talent and spread marketing and financial risks over a larger volume of activity.

Acquisitions and mergers are continuing at a fast pace as many firms expand their bakery holdings (table 54). For example, General Foods Corp., which owns the Entenmann's, Inc., and Orowheat Foods Company baking businesses, acquired the 230 lines produced by Charles Frehofer Baking Company, Inc., in late 1987 (66, p. 14; 104, p. 19). G.F. Industries, Inc., a California-based baking company, purchased Sunshine Biscuits, Inc., the third largest manufacturer of cookie and cracker products, in 1988 (44, p. 12).

The dissolution of American Bakeries Company, a wholesale baking company operating since 1924, has resulted in further changes in plant ownership (table 54). Interstate Bakeries Corp., purchased American's Merita and Cotton subsidiaries, for example, adding 10 plants to its existing units (38, pp. 1, 12; 104, p. 19). Heileman Baking Company bought four American plants, adding Kansas City

Table 50—Number of establishments in the bread, cake, and related products industry, shipment value, and market share by plant size

Item and plant size	1972	1977	1982
<i>Number</i>			
Establishments:			
1-19 employees	1,944	1,945	1,231
20-49 employees	459	314	366
50-99 employees	307	247	207
100 employees or more	613	556	501
All establishments	3,323	3,062	2,305
<i>Million dollars</i>			
Shipment value:			
1-19 employees	236	344	308
20-49 employees	327	386	568
50-99 employees	634	831	967
100 employees or more	4,956	7,714	11,300
All establishments	6,153	9,275	13,143
<i>Percent</i>			
Market share: ¹			
1-19 employees	4	4	2
20-49 employees	5	4	4
50-99 employees	10	9	8
100 employees or more	81	83	86
All establishments	100	100	100

¹ Based on shipment value.

Sources: (175, p. 20E-12; 176, p. 20E-12).

Table 51—Geographic distribution of bread and cake plants

Region ¹	1972	1977	1982
<i>Number of plants</i>			
New England	323	284	202
Middle Atlantic	848	766	553
East North Central	603	508	332
West North Central	283	241	153
South Atlantic	368	369	305
East South Central	138	126	91
West South Central	244	241	176
Mountain	149	145	126
Pacific	367	382	367
Total	3,323	3,062	2,305

¹ New England: ME, NH, VT, MA, RI, CT; Middle Atlantic: NY, NJ, PA; East North Central: OH, IN, IL, MI, WI; West North Central: MN, IA, MO, ND, SD, NE, KS; South Atlantic: DE, MD, DC, VA, WV, NC, SC, GA, FL; East South Central: KY, TN, AL, MS; West South Central: AR, LA, OK, TX; Mountain: MT, ID, CO, NM, AZ, UT, NV; Pacific: WA, OR, CA, HI.

Sources: (174, pp. 20E-5, 6; 175, p. 20E-7; 176, p. 20E-6).

and Detroit as new markets (73, pp. 1, 14). Stroehmann Bakeries, Inc., expanded its Northeastern holdings with the purchase of an American bakery in Flushing, NY, completing American's departure from wholesale baking (38, pp. 1, 12).

These acquisitions represent only a small number of the acquisitions in wholesale baking. Leveraged buyouts by the managements of Drake Bakeries and Interstate Bakeries

Table 52—Number of establishments in the cookie and cracker industry, shipment value, and market share by plant size

Item and plant size	1972	1977	1982
<i>Number</i>			
Establishments:			
1-19 employees	138	152	171
20-99 employees	103	92	104
100-499 employees	49	55	53
500-999 employees	20	20	25
1,000 employees or more	5	5	5
All establishments	315	324	358
<i>Million dollars</i>			
Value of shipments:			
1-19 employees	25	50	60
20-99 employees	153	244	353
100-499 employees	386	729	941
500-999 employees	692	1,273	2,120
1,000 employees or more	507	665	1,191
All establishments	1,763	2,961	4,665
<i>Percent</i>			
Market share: ¹			
1-19 employees	1	2	1
20-99 employees	9	8	8
100-499 employees	22	25	20
500-999 employees	39	43	45
1,000 employees or more	29	22	26
All establishments	100	100	100

¹ Based on shipment value.

Sources: (174, p. 20E-10; 175, p. 20E-12; 176, p. 20E-12).

Table 53—Geographic distribution of cookie and cracker plants

Region ¹	1972	1977	1982
<i>Number of plants</i>			
New England	14	6	16
Middle Atlantic	111	105	116
East North Central	62	68	76
West North Central	21	24	18
South Atlantic	27	39	48
East South Central	12	9	6
West South Central	13	16	12
Mountain	7	2	3
Pacific	48	55	63
Total	315	324	358

¹ New England: ME, NH, VT, MA, RI, CT; Middle Atlantic: NY, NJ, PA; East North Central: OH, IN, IL, MI, WI; West North Central: MN, IA, MO, ND, SD, NE, KS; South Atlantic: DE, MD, DC, VA, WV, NC, SC, GA, FL; East South Central: KY, TN, AL, MS; West South Central: AR, LA, OK, TX; Mountain: MT, ID, CO, NM, AZ, UT, NV; Pacific: WA, OR, CA, HI.

Sources: (174, p. 20E-7; 175, p. 20E-9; 176, pp. 20E-9, 10).

Corp., for instance, increased the degree of internal control existing in those companies (104, p. 17). Sales and acquisitions by smaller baking companies have also influenced the industry. Between September 1986 and September 1987 alone, 25 wholesale baking plants changed ownership, and

transactions involving another 46 plants were nearly complete (97, p. 7).

Excess capacity has affected the pattern of growth in the baking industry. Capacity use in wholesale baking in 1982, at 72 percent, was high relative to 65 percent of capacity registered by all manufacturing industries. Baking capacity use, at 83 percent in 1986, has remained relatively strong in comparison to 75 percent in all other industries (146, p. 109). Even so, the American Productivity Center reported that about one-fourth of U.S. baking plants were operating below 40 percent of oven capacity in 1982 (1, p. 3).

These factors have made the acquisition route the best way for many of the large bakers to expand their geographic base and enter new areas. Baking companies have found that buying distressed, obsolete plants is cheaper than building new facilities. Two factors are particularly important in creating this situation. First, the cost of building a new plant may be as much as twice the cost of buying and renovating an existing plant. Second, the buy-rather-than-build approach avoids adding additional excess capacity to that already existing. Internal expansion has not been a cost-efficient alternative to growth through acquisition in the baking industry (18, p. 51).

Integration and Diversification

These acquisitions have coupled the wholesale baking industry more closely to other food processing activities. General Foods Corp., for instance, was involved not only in the production of baked goods in 1987 (Orowheat Foods Company, Entenmann's, Inc., and Charles Frehofer Baking Company) but also in the manufacture of a variety of cereals, international products, coffees, and processed meats (65, pp. 44-45). The Anheuser-Busch Companies, Inc., which owns Campbell-Taggart, was similarly involved in brewing, rice milling, frozen food manufacturing, and snack food production (45, p. 56-58). RJR Nabisco, the leading cookie and cracker manufacturer, also marketed 4 of the top 10 U.S. cigarettes in 1987 and produced beverages, snack foods, and canned fruits and vegetables (95, pp. 32, 34; 120).

The quest for larger margins has partially stimulated the frenzy of bakery acquisition activity. Ingredient and fuel costs, for instance, have declined over much of the 1980's. Additional gains have come from greater productivity and marginal price advances. The consolidation of operations in larger, more efficient plants, the closure of small, inefficient plants, and the conversion of plants to warehouses, have also offered the potential for lower operating costs and larger margins (70, p. 50).

Consumer interest in nutrition and food variety has also attracted companies to bakery ownership. Growing consumer interest in nutrition, which began to take off in the early

Table 54—Major acquisition activity in wholesale baking, summer 1987–summer 1988

Bakery acquisition	Acquiring company or group	Comments
Jack's Cookies	Murray Bakery Products	Jack's was formerly held by Flowers Industries. Acquisition completed in July 1987.
4 American Bakeries Co. plants in St. Paul, Duluth, Detroit, and North Kansas City	Heileman Baking Co.	Increased Heileman Baking holdings from 9 to 13 plants. Acquisition effective in July 1987.
Drake Bakeries	Management-investor group	Sale to management resolved antitrust suit. Acquisition announced in July 1987.
1 American Bakeries Co. plant in New York	Stroehmann Bakeries, Inc.	Expanded Northeastern base of Stroehmann. Acquisition announced in November 1987.
Charles Freihofer Baking Co.	General Foods Corp.	Added over 230 lines to General Foods, which also owns Entenmann's and Orowheat. Acquisition announced in August 1987.
Sunshine Biscuits, Inc.	G.F. Industries, Inc.	G.F. operates a pretzel company and Granny Goose Foods. Acquisition completed in March 1988.
10 American Bakeries Co. plants in the South and Southeast (American's Merita and Cotton subsidiaries)	Interstate Bakeries Corp.	Added 1,500 route trucks to Interstate's 4,000 routes. Acquisition made in January 1988.
Interstate Bakeries Corp.	Management group	Buyout valued at about \$400 million. Acquisition completed in April 1988.
Heileman Baking Co.	R.T. Holdings, S.A.	R.T. is a Belgian sugar processor. Acquisition announced in May 1988.
Metz Baking	Amber Baking, Inc. (the former Heileman Baking Co.)	The new Metz Baking Company was the industry's 7th largest firm in 1988 and the 4th investment in baking by R.T. Holdings, S.A. Merger announced August 1988.

Sources: (38, pp. 1, 12; 44, p. 12; 67, pp. 1, 12, 13; 69, pp. 1, 12; 72, pp. 1, 10; 74, p. 10; 82, pp. 1, 11; 84, pp. 1, 12; 89, p. 10; 96, pp. 1, 12; 104, pp. 17–20).

1980's, has prompted the increased intake of complex carbohydrates. At the same time, consumers are increasingly purchasing new, specialty baked goods and foods that are easy to prepare (see previous sections). Although much of the increase in consumer spending is at instore bakeries, many of the large acquiring companies have the capital base to introduce and promote new products with wide appeal to diverse groups.

Concentration

Market share data for the wholesale baking industry suggest increased concentration among bread and cake companies in the past 15 years. Several factors, though, limit such an analysis. Because no standard unit of bread and cake output is reported at the firm level, concentration must be based on the value of output or sales per firm. Meanwhile, company reports rarely itemize financial information by industry segment, making a sales-based analysis a tenuous undertaking.

The U.S. Department of Commerce (USDC) has overcome these problems by basing concentration estimates on the

Table 55—Concentration in the bread, cake, and related products industry

Market grouping	Share of shipment value in—		
	1972	1977	1982
	<i>Percent</i>		
4 largest	29	33	34
8 largest	39	40	47
20 largest	50	54	60
50 largest	62	68	73

Source: (185).

value of wholesale shipments (table 55). According to USDC estimates, the top four firms in the bread and cake industry generated 34 percent of the 1982 value of shipments in the industry, up from 29 percent in 1972. The market share of the 50 largest bread and cake firms reached 73 percent in 1982, rising from 62 percent in 1972.

Estimates of company sales provide information about relative firm rankings, which is information that USDC does not

report (table 56). These estimates, compiled by *Bakery Production and Marketing*, indicate that Continental Baking and Campbell-Taggart ranked first in bread and cake sales throughout the 1980's. The combined retail sales of these two companies totaled nearly \$3 billion in 1986. Other important wholesalers during the 1980's include Interstate, American, Entenmann's, Flowers, and the Kroger and Safeway bakeries.

When combined with the yearly estimates of U.S. bakery sales reported in *Bakery Production and Marketing*, company sales data provide a way to estimate the market shares held by individual firms. Several assumptions underly these estimates. *Bakery's* estimate of total wholesale bakery sales includes all bakery items: cookies, crackers, breads, and cakes. To estimate total sales of breads and cakes, the fraction of all bakery sales held by bread and cake wholesalers is assumed to equal the fraction that these companies held of the value of all wholesale bakery shipments. This latter information is based on USDC's *Industrial Outlook Data File*.

The results of this analysis indicate that the market share held by the top four wholesalers increased from 22.5 percent in 1984 to 23.9 percent in 1986 (table 57). A 2.3-percentage-point increase in the market share held by Continental Baking, the largest bread and cake wholesaler, prompted this growth. The market shares of all other firms in the top-four category declined over this period, as did the shares of

several other firms listed in the top-eight ranking. Note that the top-four concentration ratio suggested by this analysis, at 24 percent, differs markedly from the 34 percent estimated by USDC for 1982.

Regardless of whether USDC or sales concentration ratios are examined, the top-ranked firms appear to hold a relatively low market share. These low market shares reflect the perishability of bread and cake products and the regional nature of the industry. The national market shares held by these top-ranked firms may, however, accelerate soon: advances in preservation and freezing technology allow shipment over long distances, and companies are aggressively expanding their marketing base in order to regain territory lost to instore bakeries.

USDC reports market share information for not only the bread and cake industry but also for the cookie and cracker industry. According to USDC data, the top four cookie and cracker companies held about 59 percent of industry value of shipments in both 1972 and 1982 (table 58). The market share held by the top 50 firms increased slightly, from 93 percent of the market in 1972 to 94 percent in 1982. This gain primarily reflects expanding market shares among the top eight firms.

As with the bread and cake analysis, estimates of company sales provide additional information about relative firm rankings (table 59). Nabisco, for instance, has had by far the

Table 56—Sales of the eight top-ranked bread and cake companies¹

1980		1982		1984		1986	
Company	Sales	Company	Sales	Company	Sales	Company	Sales
	<i>Million dollars</i>		<i>Million dollars</i>		<i>Million dollars</i>		<i>Million dollars</i>
ITT Continental Baking	1,200	ITT Continental Baking	1,458	Continental Baking	1,100 ²	Continental Baking ³	1,662
Campbell-Taggart	1,000 ⁴	Campbell-Taggart	1,170	Campbell-Taggart	985 ⁴	Campbell-Taggart	1,100 ⁴
American Bakeries	552 ⁴	Interstate Brands	668	Interstate Brands	686	Interstate Bakeries	708
Interstate Brands	538	American Bakeries	527	Flowers Industries	603 ⁵	Entenmann's ⁶	651
Beatrice Foods	300	Entenmann's	390	American Bakeries	499	Flowers Industries	622 ⁴
Orowheat/Arnold	300	Orowheat	370	Entenmann's ⁴	450	American Bakeries	444
Entenmann's Flowers	290	Flowers Industries ⁷	347	Kroger	326	Kroger	383 ⁴
Industries	231	Beatrice Foods ⁷	205	Safeway, Bakery Division	325	Safeway, Bakery Division	355 ⁴

¹ Information provided by industry analysts was used to determine the companies primarily engaged in the bread and cake industries.

² Nine-month sales only.

³ Includes acquisition of Drake Baking Company.

⁴ Estimated sales.

⁵ Total company sales.

⁶ Owned by General Foods.

⁷ Bakery operations only.

Sources: (5, p. 74; 6, p. 75; 7, p. 78; 8, p. 88).

Table 57—Sales market shares of the top-ranked bread and cake companies

Company	1984 market share	Company	1986 market share
	Percent		Percent
Continental Baking Co.	7.3	Continental Baking Co.	9.6
Campbell-Taggart, Inc.	6.6	Campbell-Taggart, Inc.	6.4
Interstate Brands	4.6	Interstate Bakeries Corp.	4.1
Flowers Industries	4.0	Entenmann's, Inc.	3.8
Top 4	22.5	Top 4	23.9
American Bakeries Co.	3.3	Flowers Industries	3.6
Entenmann's, Inc.	3.0	American Bakeries Co.	2.6
The Kroger Co.	2.2	The Kroger Co.	2.2
Safeway Stores, Bakery Division	2.2	Safeway Stores, Bakery Division	2.1
Top 8	33.2	Top 8	34.4

Sources: Table 56; (185; 192).

largest sales in the cookie and cracker industry throughout the 1980's. Keebler, the number 2 company, is advancing relative to Nabisco in sales, while the Sunshine company ranks a distant third in sales volume.

Market share estimates, calculated using the technique described in the bread and cake analysis, indicate that Nabisco held about 25 percent of national sales in the cookie and cracker market in 1986 (table 60). Keebler, at a distant second, generated about 14 percent of industry sales.¹² The market share held by each company in the top-four ranking has dropped slightly between 1984 and 1986. As in the analysis of bread and cake market shares, these estimates yield different concentration ratios than those reported by the USDC, requiring careful interpretation. Information on all companies among the top eight firms is unavailable.

Geographic Market Expansion

The marketing area served by bread and cake plants, historically limited by product perishability, has been expanding

¹² Other sources report different estimates. *Snack Food*, for instance, indicates that Nabisco held 37 percent of the cookie and cracker market in 1986 and that Keebler held a 17-percent market share (128, p. M7). These sources may not always include wholesale bakery sales to restaurants and instore bakeries, often resulting in higher concentration ratio estimates.

Table 58—Concentration in the cookie and cracker industry

Market grouping	Share of shipment value in—		
	1972	1977	1982
	Percent		
4 largest	59	59	59
8 largest	69	68	71
20 largest	83	83	85
50 largest	93	93	94

Source: (185).

over time. Several factors account for this expansion. The growth of the interstate highway network, as well as advances in preservation and refrigeration, allows baking companies to ship to markets that were once considered inaccessible. Meanwhile, the relatively low level of shipping costs in the 1980's has rendered such shipments not only feasible but also profitable. Because of these factors, fresh breads and cakes are often shipped 250 miles from production points, whereas in the 1960's, most bread was distributed within 50 miles of its production point (113, pp. 50-55).

Table 59—Sales of the four top-ranked cookie and cracker companies

Company	1980	1982	1984	1986
	Million dollars			
Nabisco Brands USA ¹	1,400	1,520	1,700	1,800 ²
Keebler Co.	472	675	912	1,005
Sunshine Biscuits, Inc.	350 ²	420	488 ²	511
Burru Lu	94	—	—	—
Interbake Foods, Inc.	—	99	—	—
General Biscuit Brands, Inc.	—	—	170 ³	130

— = Company is not among the top four firms in that year.

¹ Biscuit division only.

² Estimated sales.

³ Combined Burru Lu and Salerno-Megowan sales.

Sources: (5, p. 74; 6, p. 75; 7, p. 78; 8, p. 88).

Table 60—Sales market shares of the top-ranked cookie and cracker companies

Company	1984	1986
	Percent	
Nabisco Brands USA ¹	27.9	25.4
Keebler Co.	15.0	14.2
Sunshine Biscuits, Inc.	8.0	7.2
General Biscuit Brands, Inc.	2.8	1.8
Total	53.7	48.6

¹ Biscuit division only.

Sources: Table 59; (185; 192).

In response to these changes in access, many firms have adopted a regional pattern of production and shipment. These regional bakery networks, known as "reciprocal baking" arrangements, involve scheduling production capacity so that a company's plants in the same region specialize in the manufacture of different bakery products. These plants then ship items through other specialized company plants for final assembly, distribution, and sale to consumers (27, p. 3).

The networking of plants in a "reciprocal" arrangement maximizes efficiency. The traditional geographic area of a single plant cannot usually generate sufficient sales to support efficient production or justify the capital investment needed to facilitate long runs of specialized products. Plants that produce a variety of baked goods cannot maximize efficiency because of the costs of equipment changeover, including the costs of down time and uncertain quality during new product startup. In contrast, reciprocal arrangements achieve near-maximum efficiency by combining the economies of long production runs with a sizable geographic base of customer demand (18, pp. 48-49).

Because of the large volumes involved, reciprocal arrangements remain the domain of large firms. Flowers Industries, for example, relies on a "reciprocal baking" format for the distribution of fresh products over distances that often exceed 200 miles (18, p. 38). Interstate Bakeries, through the acquisition of Purity Baking and Merita, also emphasizes the use of reciprocal baking and regional distribution networks (69, p. 12).

Some companies are shipping not only fresh products but frozen baked goods as well. Flowers Industries, for example, ships bread that is baked and frozen in Atlanta to West Texas and New Mexico, where it is thawed and sold as fresh. Campbell-Taggart likewise ships frozen bread from its Paris, TX, and Ft. Payne, AL, plants to be sold as fresh over widespread areas (18, pp. 39-40).

Many companies have facilitated this expansion in shipping distances by converting production facilities into distribution points. Continental Baking ceased production at its Raleigh, NC, plant and now distributes bread baked in Richmond, VA, through that facility. Campbell-Taggart has similarly converted plants in Kansas City, MO, and Waco, TX (18, p. 39).

Because there are now more large, multiregional competitors in each distribution market, industry competitiveness is likely more intense, particularly in high-volume product lines (18, pp. 39-40). The national market shares held by companies engaged in reciprocal baking may likely increase, and lines previously unavailable in certain regions may begin to appear.

Foreign Investment

Foreign direct investment in U.S. bakeries jumped from \$308 million in 1980 to \$974 million in 1987, mostly between 1985 and 1987 (154, 163, 165). In 1988, foreign investment again grew markedly. R.T. Holdings, a major Belgian sugar processor, announced its purchase of the Heileman Baking Company in May 1988 (72, pp. 1, 12). Heileman held 12 bread and cake plants in 5 Midwestern States, as well as 2 cookie and cracker plants and 1 snack food plant. R.T. Holdings announced its merger with Metz Baking in August 1988 to form a major regional company, the industry's seventh largest firm, with total annual sales near \$500 million (84, pp. 1, 12).

At the same time, U.S. wholesale baking companies are increasingly investing in the licensing and manufacturing of baked goods overseas. The Roman Meal Company, for example, licensed the rights to manufacture and sell its products to seven Japanese bakers in 1987. Campbell Soup, the owner of Pepperidge Farm, acquired a French cookie company to supplement its Belgian production. Borden purchased a West German retail bakery chain in 1987, and RJR Nabisco opened a cookie and cracker plant in Thailand (183, p. 42-22).

Conduct of the Baking Industry

The increasing consumption of baked goods has affected firm conduct in the wholesale baking industry. A large number of wholesalers are restructuring their operations to respond to growing consumer demand, increase plant efficiency, and decrease company costs. Many wholesale bakeries are also investing in the promotional activities and new product development necessary to attract greater consumer loyalty and expand their market share. The large cookie and cracker wholesalers (Nabisco, Keebler) will likely continue to focus on national branding. The major bread and cake wholesalers (Interstate, Campbell-Taggart) will more likely focus on expanding their regional sales bases.

Plant Investment

Some wholesale baking companies have been building new facilities as part of their company restructuring policy. Several companies have expanded plant capacities, and new plants frequently have been constructed in areas of above-average population and economic growth, particularly in the Sun Belt (50, p. 45). This activity is continuing. Nabisco, for example, scheduled a 1.1-million-square-foot baking plant in 1988, its first new baking plant since 1973, to be built near Raleigh, NC (91, p. 14). Bahlsen, Inc., another cookie and cracker company, is building a new 250,000-square-foot plant at Cary, NC (104, p. 20). And Metz Baking began site work in 1987 for a bread and roll plant near Omaha, NE (98, p. 56).

At the same time, many companies have closed small, inefficient plants, particularly those in areas with a declining population. Activities performed at such plants are often consolidated within the company structure. Keebler, for instance, closed its Philadelphia operation in 1986 (184, p. 39-2). Continental ceased production at four factories in 1986 and at one plant in 1987 (104, p. 20; 184, p. 39-2). Campbell-Taggart closed three plants between April 1987 and April 1988 (104, p. 20).

According to a 1987 *Milling and Baking News* survey, 31 percent of the multiple-plant bread and cake wholesalers responding indicated that they had closed at least one plant within their company between July 1986 and July 1987 (108, p. 29). Of these respondents, 21 percent said that they had consolidated more operations into fewer plants, while 8 percent said that they had consolidated the same operations into fewer plants. Only 2 percent of the respondents indicated that fewer operations were performed in fewer plants.

The potential for enhanced profits and greater operating efficiency has particularly influenced plant closing, consolidation, and new construction decisions (136, pp. 21-25). When a plant is shut or sold, the energy, maintenance, and depreciation costs associated with that plant no longer exist. Companies can often consolidate activities into one plant, or a new, more efficient plant, with a less-than-proportionate increase in labor and energy costs. Workers can specialize more narrowly when plants are consolidated (as in the reciprocal baking arrangements) and can use equipment more efficiently (121, pp. 81-84).

Along with the trend toward plant restructurings, bakers are also adopting new technologies that improve efficiency, increase the degree of quality control, and reduce costs. Of the wholesale bakers surveyed by *Bakery Production and Marketing* in 1986, for instance, 72 percent stated that they expected to modernize their current production lines during 1987. Sixty-six percent of the respondents planned to invest in computers, 56 percent planned to purchase new packaging equipment and conveyors, and about 32 percent planned to purchase more modern ovens and freezers (116, pp. 89-90).

The emphasis large companies place on plant profitability has had a sizable effect on other baking firms. The larger, lower cost units tend to significantly increase local market capacity, intensifying price competition. In response, small, inefficient bakers have frequently closed marginal plants. Often, closing a plant is viewed as a wiser decision than heavy investment in competitive facilities with uncertain returns (23, pp. 16A, 18A; 136, p. 21).

Competition from Instore Bakeries

The rapid growth of instore bakeries in recent years has forced noncaptive wholesalers to re-examine the products

they offer and their marketing methods. The number of instore bakeries jumped from 13,800 units in 1982 to 18,850 units in 1987, a 37-percent increase (31, p. 5A; 32, p. 8A). These instore units were in 62 percent of all U.S. supermarkets in 1987 and contributed an average of \$4,875 weekly to each store's sales. They generated about \$4.8 billion in sales in 1987, up 9 percent from \$4.4 billion in 1986, and had average gross margins of nearly 48 percent (32, pp. 7A-14A). The Kroger Company and Winn-Dixie Stores, Inc., each operated over 1,000 instore units in 1987 (table 61).¹³

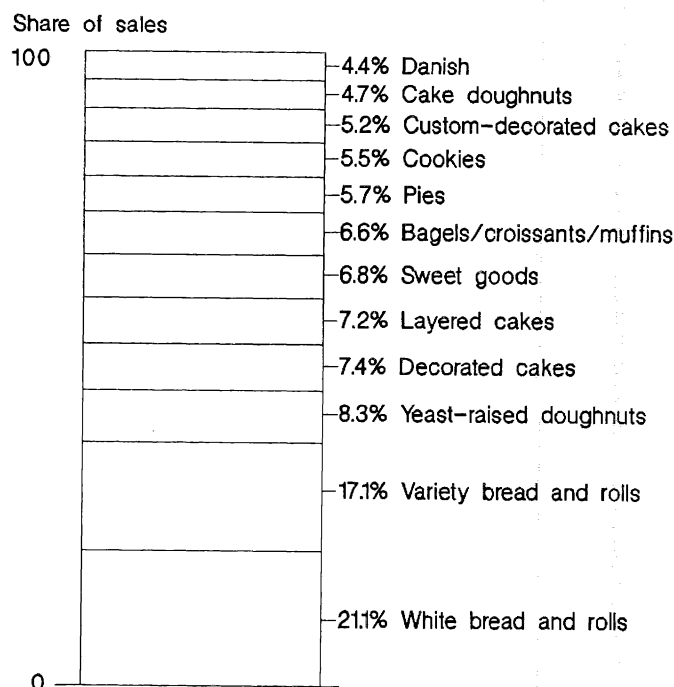
Even though instore bakeries continue to be a dynamic segment of the grocery business, their rate of growth is slowing. This trend is evident in both sales and instore bakery numbers. For instance, the number of instore bakeries jumped by 13 percent between 1982 and 1983, but by only 4 percent between both 1983-84 and 1984-85. Sales increased by 60 percent between 1982 and 1986, but by only 6 percent between 1985 and 1986 (31, p. 5A).

Instore bakeries offer a wide variety of items (fig. 4). Breads and rolls account for the largest share of the instore bakery sales dollar, followed by doughnuts, cakes, and sweet goods. Because of the high markup on many of these items, instore bakeries typically generate high returns, contributing an

¹³ For more information on instore bakery operations, see 11, pp. 42-57, and 12, pp. 23-30.

Figure 4

Where the instore bakery sales dollar goes¹



1/ 1987 data. Source: (78).

Table 61—Ranking of supermarkets by instore bakery ownership

Chain	Number of instore bakeries in 1987	Rank	
		1986	1987
The Kroger Co.	1,164	2	1
Winn-Dixie Stores, Inc.	1,068	1	2
Safeway Stores, Inc.	730 ¹	3	3
The Great Atlantic and Pacific Tea Co.	649	4	4
Albertson's, Inc.	381	5	5
American Stores Co.	275 ¹	2	6
Publix Supermarkets—Danish Bakery	250	6	7
Lucky Stores, Inc.	203 ¹	7	8
The Grand Union Co.	180	8	9
Ralph's Grocery Co.	123 ¹	11	10
Hy-Vee Stores	119	12	11
Vons Companies, Inc.	115	14	12
Ingle's Markets, Inc.	105 ¹	13	13
H.E. Butt Grocery Co.	104	15	14
Giant Food Stores, Inc.	90 ¹	39	15
Food Lion, Inc.	85 ¹	2	16
Harris Teeter Supermarkets, Inc.	84	18	17
Giant Food, Inc.	80 ¹	16	18
Bruno's, Inc.	78 ¹	19	19
Loblaws Companies, Ltd. (U.S.)	77 ¹	31	20
Delchamps, Inc.	76 ¹	27	21
Weis Markets	76	21	22
Borman's Inc./Farmer Jack's	75 ¹	49	23
First National Supermarkets, Inc.	75 ¹	22	24
Smith's Management Corp.	75	20	25

¹ Instore bakery numbers are estimated.

² Not ranked in 1986.

Source: (16, p. 93).

average 3.9 percent of supermarket profits in 1987 (32, p. 9A). Their contribution to net profit, however, is uncertain.

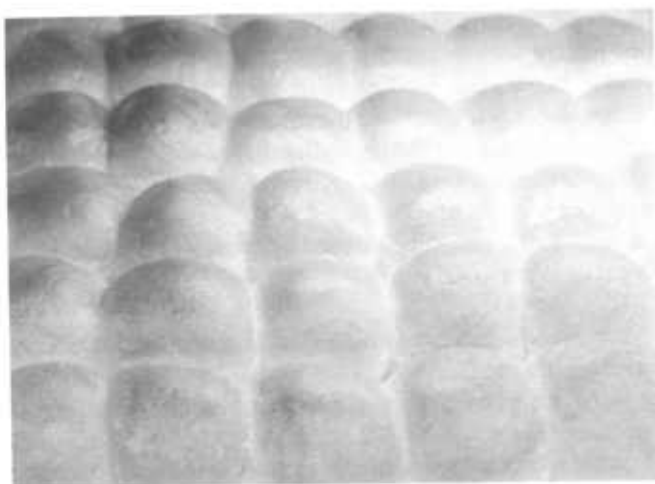
Observers disagree about the longrun importance of instore bakeries. Some analysts are quick to emphasize the competition that instore facilities create for wholesalers. They argue that the presence of instore bakeries often reduces the tendency of consumers to buy wholesale cakes, cookies, and breads. They contend that instore baked goods are often perceived as fresher and of higher quality. Instore bakeries, often positioned close to the store entrance, frequently offer decorated cakes and specialty breads that are not available elsewhere in the store. In addition, employees at instore bakeries are often knowledgeable about baked foods, can take special orders, and frequently give out samples. Unlike shelf or freezer case purchases, consumers can choose the desired number of items (53, p. 31; 103, pp. 29, 32).

Other analysts disagree with the importance attributed to instore bakeries. These observers argue that instore bakeries charge premium prices that consumers will not likely pay on a regular basis. In addition, bake-shop purchases are often made on impulse. Consumers who write "bread" on their shopping list and buy a premium instore loaf will not typically do so every week. Finally, these analysts point out that

some supermarkets have found that instore bakeries are not profitable. Acme, for instance, has closed its instore bakeries (24).

Regardless of the competitive situation between instore bakeries and wholesalers, noncaptive wholesalers are beginning to take advantage of the promotional efforts used by instore bakeries. Packaged baked foods displayed in the instore bakery section, for instance, can reflect the same high-quality image of goods that are freshly baked. Items that have been successful at instore bakeries (specialty items and single-serve units) are now being marketed in prepackaged form by wholesalers (53, pp. 31-32).

Perhaps most importantly, wholesalers are often supplying instore bakeries, retail specialty food shops, and restaurants with fresh baked goods. Lacking experienced scratch bakers, many instore bakery operators depend on the frozen dough provided by wholesalers that is later "baked off" and sold as fresh (77, pp. 36-38). Frozen doughs are often used by instore bakeries to produce bagels, rolls, and cookies (15, p. 128). About 80 percent of all instore bakeries in 1986 and 1987 depended solely on bake-off production or on a combination of the bake-off and scratch-mix formats (15, p. 126; 32, p. 14A).



The baking industry is staying competitive by developing new products, mainly breads, buns, and rolls.

Table 62—New product development by bread and cake companies, July 1986–July 1987

New products developed	Multiple-plant companies	Single-plant companies
<i>Percent of plants reporting</i>		
Bread, buns, rolls	70.6	62.7
Sweet goods	45.1	27.7
Muffins, biscuits	31.4	24.1
Cakes	29.4	19.3
Doughnuts	27.5	15.7
Cookies, crackers	17.6	10.8
Frozen dough	17.6	9.6
Croissants, puff pastry	15.7	8.4
Pies	15.7	10.8
Ethnic products	7.8	15.7
Pizza	2.0	4.8

Source: (108, p. 30).

Penetrating new markets is easier for wholesalers today than in the past. Bakers have found that high-quality products will sell well outside their regions of origin if marketed as specialty items, such as bagels or Southern-style biscuits. Greater job mobility has transplanted tastes from State to State, making no one market off-limits to any particular food. With increasing mobility, regional newcomers bring their food preferences and introduce other consumers established in an area to new food items. Because of these factors, the Northeast, historically viewed as the toughest market in which to introduce new products, is opening up (52, pp. 33-36).

With growing product proliferation, wholesalers are often finding supermarket shelf space for new products to be extremely costly to obtain. In 1987, over 10,000 new items were carried on grocery store shelves, more than double the number of 5 years ago. Because of intense competition among wholesalers and the risks of new product failure, some retailers are charging prices ranging from \$15,000 to \$40,000 per product per store to stock selected new items. Wholesalers might pay \$2 to \$3 million nationally in "slotting" fees to introduce a new product in stores across the country (112, p. 16).

The competitive power of grocery chains and their instore bakeries cannot be overestimated. Supermarket chains maintain a competitive advantage because they control shelf space for all baked goods (their own private label items as well as those of independent wholesalers) and often determine retail prices. Some observers argue that the only competitive advantage of noncaptive wholesale bakers has been product freshness, an advantage that has diminished with the emergence of instore bakeries (18, pp. 35-36).

The growth of electronic scanning, which allows quick sales monitoring, may help wholesalers balance the clout of food retailers. Because of scanning, the lag time needed by a supermarket chain, independent grocer, or convenience store operator to evaluate the sales performance of a baked good has narrowed considerably. With the advancement of software used to analyze these data, bakers may be able to offset some of the advantages of retailers by responding more quickly to changes in product demand (24).

New Products

With changing consumer tastes and growing competition, wholesalers are accelerating the pace of new product introductions. Bread and cake wholesalers, responding to a *Milling and Baking News* survey, indicated that, on average, their companies introduced four new products between July 1986 and July 1987 (108, p. 30). Multiple-plant companies, with the diversified asset base to risk product failures, introduced more products than did single-plant firms in almost all product categories. Companies reported that the development of new bread, bun, and roll products far outpaced product development in any other category (table 62). *Bakery Production and Marketing* reported that, in 1986, over 550 new bakery products were introduced, more than 1.5 per day (28, p. 15).

Advertising and Promotion

Advertising is an important element in conveying a product's image and in developing the brand loyalty that justifies new-product development. Forty-eight percent of the respondents to a *Milling and Baking News* survey indicated that they increased their advertising expenditures between July 1986 and July 1987, with an average increase of 16 percent (108, p. 30). When developing an advertising strategy, however, wholesalers face a formidable task. With hundreds of purchase alternatives, including an average of 350 bread loaves in the typical supermarket, consumers hold little brand loyalty. "People shop with their eyes," one food company vice-

president stated. "They go down the aisle and get whatever hits them." (80, p. 9) According to another industry analyst (80, p. 9):

With few exceptions, most shoppers decide what brand to buy only after entering the grocery store ... Consumers are not as brand loyal as in the past... A consumer's shopping list may read "bread," but chances are it doesn't specify Wonder, Pepperidge Farm, or any other brand...

Wholesalers use instore advertising to attract consumers. Wholesalers are beginning to use video kiosks that provide product information segments, many of which resemble music videos. The "Cuisine Machine" is a computerized recipe dispenser that often features specific ingredient brand names in recipes. Safeway Stores is experimenting with a "Coupon Systems" machine that allows shoppers to select cents-off coupons for specific products (53, pp. 35-36).

At the same time, packaging changes, reported by 70 percent of the *Milling and Baking News* survey respondents, effectively grab consumer attention. In addition to increasing advertising expenditures, many wholesalers are delivering items to a larger number of stores (108, pp. 29-30).

The growing competitiveness of the baking industry has put many small, single-plant operations at a disadvantage. These companies do not have the capital base to intensely invest in new product development and national advertising campaigns. Supermarkets often succumb to the "muscle" of major wholesalers in product placement because their goods, backed by heavy advertising, often have a higher chance of selling than those of small bakers. In an industry shifting its focus from selling quantity to providing variety, small wholesale bakers must seek out narrow target audiences. Providing distinctive products will be the key to profitable market shares for these bakers (52, p. 36).

Delivery Operations

Selling and distribution techniques can vary significantly among companies. Distributors employed by small, single-plant companies, particularly manufacturers of specialty goods, perform both sales and delivery functions and typically deliver goods either by car or van. In the case of large, multiplant firms, semitrailers carry products long distances to distribution warehouses. Highly perishable goods are often delivered daily, while less perishable goods, such as frozen products, cookies, and crackers, are delivered much less frequently.

Investment in company-owned equipment, such as walk-in/route vans, medium-sized trucks, and tractor/trailer combinations, has continued at a fast pace in the 1980's. A 1986 survey of 62 wholesalers conducted by the American Bakers

Association revealed that planned new vehicle purchases for the near future were nearly double the levels reported in 1984. Route vans, accounting for about 71 percent of fleet ownership, continued to be the most popular method of distribution because of the flexibility they offer over short route distances. Trucks are used most often for deliveries of less perishable goods to warehouses. Cars, accounting for 8 percent of fleet ownership, are used by small wholesalers for local deliveries (42, p. 14).

Many wholesalers have investigated alternative distribution methods during the 1980's (136, pp. 24-25). The use of independent distributors, in particular, has become increasingly popular. The American Bakers Association survey indicates that the use of independent distributors in the walk-in/route van category was at 3,527 vehicles in 1986, up 30 percent from the level reported in 1984. Altogether, this "outside" fleet operated about 8 percent of all route vans in the industry (42, p. 14).

The trend toward leasing vehicles is also an important industry phenomenon. Fifty percent of all tractors operating in bakery fleets were leased in 1986, as were 20 percent of the walk-in/route vans, 31 percent of the medium-sized trucks, and 39 percent of all cars. By leasing vehicles, wholesalers can retain a greater degree of flexibility than if they committed themselves to ownership of their entire fleet (42, p. 14).

Drivers doubling as sales representatives, although of less significance to the industry than at one time, have an extremely important role in promoting the wholesaler's image. With store deliveries, driver-sales representatives often arrange packaged products on the shelf and assess the quality of products delivered on prior days. They examine inventories of both products they have delivered and those supplied by competing bakeries. Driver-sales representatives interact with individuals making purchasing decisions, whether deliveries are made to warehouses or retail stores, and they have a strong influence on the retail outlet's perception of the bakery and on future retail purchases.

The costs of store delivery and rack service, which can total about 40 percent of the sales dollar, are forcing wholesalers to change the ways in which they service stores. Wholesalers are responding by increasingly using independent distributors. These distributors consolidate items supplied by different wholesalers for drop shipment to retailers. The trend is toward one individual single-handedly servicing retail bakery sections. Such arrangements can, however, substantially lessen the degree of wholesale control over product quality (4, pp. 81-96; 29, pp. 21-22; 101, pp. 42-56).

Other bakers are selling their routes to route representatives. Tasty Baking of Philadelphia, for instance, has encouraged its route sales representatives to purchase their routes and be-

come independent business people. Flowers has experimented with the same idea (24).

Performance of the Baking Industry

Although wholesale baking company acquisitions are continuing at a rapid pace, the industry remains highly competitive in the variety of goods offered and their prices. With the proliferation of new products, price competition appears to be reducing company profitability. At the same time, manufacturing and ingredient costs appear relatively stable.

Profitability

Profits in wholesale baking appear higher in the mid-1980's than in the late 1970's. During the late 1970's, wholesale baking profitability was fairly low. Name-brand sales of white bread, a wholesale staple, declined as consumers increasingly favored specialty items. Most bread was sold under supermarket private labels. Companies focused on

trade dealings to increase their sales rather than on the advertising and new product development necessary to attract consumer brand loyalty (41, pp. 55-66).

Wholesale costs and profits for producers of white bread remained fairly stable between 1981 and 1984 (table 63). Manufacturing costs, for instance, increased by 1.87 cents per 1-pound loaf, while ingredient costs fell 0.58 cent. Selling and advertising expenses and administrative costs increased somewhat. Overall, pretax profits increased from 2.19 to 2.48 cents per 1-pound loaf.

Industry analysts indicate that, overall, wholesale baking profits reached a favorable level in the mid-1980's. The growth in profitability can be attributed to increased consumer demand, the more aggressive marketing strategies used by wholesale companies, the revitalization introduced by changes in ownership and company restructuring, and the relatively stable level of input prices (18, pp. 28-29; 93, p. 10).

Table 63—Unit value and cost per 1-pound loaf of bread for wholesale bakeries as reported by the American Bakers Association¹

Item	Survey year ²			
	1981	1982	1983	1984
<i>Cents per 1-pound loaf</i>				
Wholesale production unit value	51.83	53.96	53.41	53.96
Expenses:				
Ingredients—				
Flour	7.95	7.67	7.76	7.29
Sweeteners	1.27	.98	1.10	1.01
Shortening	.87	.78	.88	.96
Other ingredients	2.44	2.39	2.38	2.69
Subtotal	12.53	11.82	12.12	11.95
Manufacturing—				
Wrapping material	1.97	1.95	1.91	1.99
Labor and fringes	4.74	5.10	5.09	5.37
Indirect wages and fringes	2.63	2.78	2.85	3.38
Other manufacturing	3.49	3.85	3.47	3.96
Subtotal	12.83	13.68	13.32	14.70
Selling and advertising—				
Driver wages and fringes	6.64	7.01	7.02	6.29
Other wages and fringes	4.46	4.72	4.72	4.04
Advertising and promotion	.95	.88	1.04	1.29
Other selling and advertising	5.05	6.08	5.70	6.17
Returns (full wholesale value)	4.13	4.07	4.22	3.61
Subtotal	21.23	22.76	22.70	21.40
Administrative	3.05	3.26	3.23	3.43
Total expenses	49.64	51.52	51.37	51.48
Pretax profit	2.19	2.44	2.04	2.48
<i>Number</i>				
Plants included in surveys ³	263	256	244	140

¹ Includes all loaf varieties and brown n' serve and bread-type rolls. Chain store bakeries were not included in surveys.

² 1984 is the last year in which the survey was conducted.

³ A total of 22 companies participated and submitted data in the 1984 survey of 140 plants.

Source: (43, pp. 1, 52).

This scenario may, however, be short-lived as intercompany price competition intensifies. In the late 1980's, several baking companies are experiencing an assortment of pressures on profitability (129, p. 38). Sales appear to be increasing but without the direct margin improvement realized in the immediate past from declining ingredient costs (81, pp. 1, 57, 58, 63; 93, p. 10).

Marketing Margins: White Pan Bread

For many years, the price of white pan bread has provided a key indication of the relationship between the farm value of wheat and the retail value of end products in the bread and cake industry. This price spread appears to have more than doubled between 1970 and 1987 (table 64). The average retail price of a 1-pound loaf, for example, rose from 27.7 cents in 1970 to 54.7 cents in 1987, while the farm value of all ingredients increased from 3.4 cents to 3.8 cents. The farm-to-retail spread increased from 24.3 cents per loaf to 50.9 cents, or by slightly over 100 percent.

A more detailed analysis of marketing spreads for white pan bread indicates that both the level of price spreads and their change over time vary considerably among different marketing levels (table 65). At the baking level, for example, the price spread increased from 66 percent of the retail price per

loaf in 1983 to 70 percent in 1984. Over the same period, the wholesale-to-retail spread decreased from 17 to 12 percent. Milling margins remained at a relatively low 2 percent of retail loaf value.

Wholesale and Retail Baked Goods Prices

Wholesale prices for many baked goods rose somewhat faster than the rate of inflation between 1972 and 1982 (tables 66 and 67). Wholesale prices for sweet yeast goods, fruit cakes, snack pies, and certain cookies and crackers increased at the fastest rate. The pace of price increase for breads and rolls was typically much lower. As input prices moderated in the mid-1980's and intercompany competition intensified, wholesale prices for many items appeared to stabilize (183, p. 42-19; 184, pp. 39-20, 21; 192, p. 82). Increases in the prices of packaging, flour, and other ingredients in 1988 and 1989, however, may signal a reversal in this trend (182, pp. 39-14, 15).

Retail prices for baked goods were quite variable in the mid-1980's. The retail price per pound of white pan bread, for instance, increased by 18 percent between 1980 and 1988 (table 68). The prices of French bread and whole wheat bread, two of the more popular items, rose by 40 percent and 29 percent, respectively.

Table 64—Retail price of white bread, farm value of ingredients, farm-to-retail price spread, and farm value share of retail price per 1-pound loaf

Year	Retail price	Farm value			Farm-to-retail price spread	Farm value share	
		Wheat ¹	Other farm ingredients ²	All ingredients ³		Wheat	All ingredients
		Cents				Percent	
1970	27.7	2.6	0.8	3.4	24.3	9	12
1971	28.5	2.6	.9	3.5	25.0	9	12
1972	28.2	2.9	.9	3.8	24.4	10	13
1973	31.5	4.1	1.4	5.5	26.0	13	17
1974	39.3	5.4	2.5	7.9	31.4	14	20
1975	41.0	4.5	2.3	6.8	34.2	11	17
1976	40.2	3.8	1.7	5.5	34.7	9	14
1977	40.5	2.7	.7	3.4	37.1	7	8
1978	41.7	3.3	.7	4.0	37.7	8	10
1979	46.7	4.1	.8	4.9	41.8	9	10
1980	50.9	4.5	.8	5.3	45.6	9	10
1981	52.5	4.7	.8	5.5	47.0	9	10
1982	53.2	4.4	.6	5.0	48.2	8	9
1983	54.2	4.5	.7	5.2	49.0	8	9
1984	54.1	4.3	.8	5.1	49.0	8	9
1985	55.3	4.1	.7	4.8	50.5	7	9
1986	56.5	3.5	.5	4.1	52.5	6	7
1987	54.7	3.3	.5	3.8	50.9	6	7

¹ Payment to farmers for the quantity of wheat (approximately 0.86 pound) required to produce the flour for a 1-pound loaf of white bread, minus the value of millfeed byproducts. Based on average farm prices for hard winter and spring wheat in 11 States producing these wheats through 1982; all wheat prices used beginning in 1983.

² Value for lard, shortening, granulated sugar, and nonfat dry milk through 1976. Value for 1977 forward is for lard, soybean oil, high-fructose corn syrup, corn syrup, and soy-whey blend.

³ Totals may not add due to rounding.

Source: (17, p. 52).

Selected Industry Statistics

Selected operating data indicate that both the bread/cake and cookie/cracker industries have performed relatively well during the 1970's and 1980's. In the bread and cake industry, progress appears most apparent in the areas of cost control and productive efficiency (table 69). The ratio of material cost to shipment value, for instance, declined from 43 percent in 1972 to 37 percent in 1986. The ratios of

material and payroll cost to shipment value and payroll to value added declined even more.

Statistics for the cookie and cracker industry are similar (table 70). The ratio of material cost to shipment value has declined over time. The ratios of material and payroll cost to shipment value, and payroll to value added, have contracted even further, signaling increases in productivity. New capital expenditures in both industries have expanded with the

Table 65—Estimated price and marketing spreads for white pan bread ingredients per 1-pound loaf and per cwt of flour¹

Item	Jan.-Mar. 1983		Jan.-Mar. 1984	
	Value per loaf	Value per cwt of flour	Value per loaf	Value per cwt of flour
	<i>Cents</i>	<i>Dollars</i>	<i>Cents</i>	<i>Dollars</i>
Retail price (BLS)	54.30	87.31	54.20	87.15
Farm-to-retail price spreads: ²				
Wholesale-to-retail ³	9.02	14.50	6.77	10.88
Baking ⁴	36.02	57.92	37.73	60.68
Flour milling	1.03	1.66	1.21	1.95
Other—				
Wheat, farm-to-flour mill	.89	1.43	.95	1.53
Other farm ingredients ⁵	.68	1.09	.81	1.31
Flour, flour mill-to-baker	.57	.92	.60	.97
Nonfarm ingredients ⁶	1.05	1.69	1.07	1.71
Total	49.26	79.20	49.14	79.02
Farm value of ingredients:				
Wheat	4.42	7.11	4.17	6.70
Other farm ingredients	.62	1.00	.89	1.44
Total	5.04	8.11	5.06	8.13
Cost of farm ingredients:				
Flour—				
F.o.b. bakery	6.91	11.11	6.93	11.14
F.o.b. flour mill	6.34	10.19	6.33	10.18
Wheat— ⁷				
F.o.b. flour mill	5.31	8.53	5.12	8.23
Farm value	4.42	7.11	4.17	6.70
Other—				
F.o.b. bakery	1.30	2.10	1.71	2.74
Farm value	.62	1.00	.89	1.44
<i>Dollars per cwt</i>				
Prices of flour and millfeeds:				
Flour—				
F.o.b. bakery		11.11		11.14
F.o.b. flour mill		10.19		10.18
Millfeeds—				
F.o.b. flour mill		4.13		4.93
<i>Dollars per bushel</i>				
Prices of wheat:				
F.o.b. flour mill		4.28		4.23
Farm value		3.57		3.45

BLS = Bureau of Labor Statistics, U.S. Department of Labor.

F.o.b. (free on board) = Seller is responsible for placing grain at the end of the loading spout. Buyer is responsible for transportation.

¹ USDA has not compiled information in this table for more recent years than 1983 and 1984.

² Price spreads may not add due to rounding.

³ Difference between retail and wholesale price of bread.

⁴ Difference between wholesale price and cost of bread ingredients, F.o.b. bakery.

⁵ Includes processing, transportation, and merchandising for lard, soybean oil, high fructose corn syrup, corn syrup, and soy-whey blend.

⁶ Difference between estimated cost to baker and estimated farm value.

⁷ Estimated cost to baker of yeast, yeast food, salt, and other nonfarm ingredients.

⁸ Price adjusted for value of millfeeds.

Source: (157, p. 16).

Table 66—Estimated wholesale prices of breads, cakes, and related products¹

Product	Average wholesale price			Change	
	1972	1977	1982	1972-77	1977-82
	----- Cents per pound -----			----- Percent -----	
Bread: ²					
White pan	20.0	30.0	40.8	50	36
White hearth ³	29.6	35.1	47.3	19	35
Whole wheat ⁴	24.9	36.9	49.2	48	33
Rye ⁵	27.7	40.7	54.4	47	34
Other ⁶	29.4	41.7	55.8	42	34
Rolls, bread-type: ²					
Hamburger and wiener rolls	24.4	36.4	48.8	49	34
Brown and serve	29.2	43.9	57.9	50	32
English muffins	NA	49.1	63.9	NA	30
Hearth rolls	NA	58.5	52.5	NA	-10
Other ⁷	NA	47.8	55.3	NA	16
Stuffings ⁸	30.2	55.9	63.1	85	13
Sweet yeast goods: ⁹					
Yeast-raised doughnuts	39.4	76.4	115.8	94	52
Other ¹⁰	51.1	64.6	104.7	26	62
Soft cakes: ⁹					
Snack cakes	NA	74.6	95.6	NA	28
Fruit cakes	NA	113.4	223.5	NA	97
Other ¹¹	NA	80.9	109.2	NA	35
Pies: ⁹					
Snack pies	NA	54.7	89.2	NA	63
Other pies	NA	67.0	77.3	NA	15
	----- 1972 = 100 -----				
GNP implicit price deflator	100.0	140.0	207.4	40	48

NA = Not available.

¹ Average price based on quantity and value of shipments reported by the U.S. Department of Commerce, Bureau of the Census.

² Includes frozen items.

³ Includes French and Italian.

⁴ Includes cracked wheat, multigrain, and other dark breads.

⁵ Includes pumpernickel.

⁶ Includes raisin, potato, and self-rising.

⁷ Includes kaiser, parkerhouse, and bagels.

⁸ Includes croutons and bread crumbs.

⁹ Does not include frozen items.

¹⁰ Includes sweet rolls and coffee cake.

¹¹ Includes pound, layer, sheet, and cheese, except frozen.

Sources: (14, p. 236; 174, p. 2E-13; 175, p. 20E-15).

growth of automation, and the annual hours per production worker have remained fairly constant.

The largest firms in the baking industry (those with 1,000 or more employees) appear to have the greatest advantages in material, wage, and payroll costs (tables 71 and 72). Overall, economies of scale in procurement and labor specialization, as well as production efficiencies, reduce the expenses of large plants. The smallest firms in the bread and cake industry, however, are surprisingly efficient. One of their most important advantages may be the employment of family members, which can significantly reduce labor costs. In addition, the smallest companies often sell very high-margin, specialized products with short production runs.

Data Sources

The information contained in this report is all secondary in nature. Primary data sources include issues of *Milling and Baking News*, *Census of Manufactures* reports, *U.S. Industrial Outlook* reports, USDA publications, legal petitions, and personal contacts. References also come from trade publications, including *Supermarket Business*, *Bakery Production and Marketing*, *Baking Industry*, and *Snack Foods*.

The data reported in these publications must be interpreted with care. The relevant census category for flour milling, "Flour and Other Grain Mill Products" (SIC 2041), includes not only flour mills but other establishments "primarily

Table 67—Estimated wholesale prices of prepared mix, cookie, and cracker products¹

Product	Average wholesale price			Change	
	1972	1977	1982	1972-77	1977-82
	----- Cents per pound -----			----- Percent -----	
Cracker products:					
Graham	35.3	67.7	86.6	92	28
Saltines	37.4	60.9	83.9	63	38
Cracker crumbs	22.6	48.4	51.9	114	7
Cracker sandwiches ²	55.2	91.3	127.0	65	39
Pretzels	44.2	52.7	84.0	19	59
Other crackers ³	50.0	56.3	115.7	13	106
Cookie products:					
Sandwich cookies ⁴	37.4	69.4	98.9	86	43
Marshmallow cookies	44.1	81.9	107.3	86	31
Wafers ⁵	24.5	45.1	63.0	84	40
All other cookies and wafers ⁶	41.3	69.1	105.9	67	53
Toaster pastries	45.0	52.9	68.5	18	29

¹ Average price based on quantity and value of shipments reported by the U.S. Department of Commerce, Bureau of the Census.

² Made from crackers produced at the same plant.

³ Includes low-sugar content biscuits, melba toast, and sprayed varieties.

⁴ Made from cookies produced at the same plant.

⁵ For making ice cream sandwiches.

⁶ Except wafers for making ice cream sandwiches.

Sources: (174, p. 20E-13; 175, pp. 20E-15, 16).

Table 68—Retail prices of selected baked goods

Product	1980	1982	1984	1986	1988 ¹
	Dollars per pound				
White pan bread	0.51	0.53	0.54	0.56	0.60
French bread	.78	.90	1.01	1.05	1.09
Whole wheat bread	.73	.82	.88	.87	.94
Chocolate cupcakes	1.58	1.80	2.04	2.29	NA
Chocolate chip cookies	1.58	1.77	1.87	1.94	2.11
Salted soda crackers	.81	.88	.96	.99	1.05

NA = Not available.

¹ Estimated by the U.S. Department of Commerce, International Trade Administration.

Sources: (182, p. 39-16; 183, p. 42-19; 187; 188).

engaged in milling flour or meal from grain, except rice," including dry corn, buckwheat, and rye mills.¹⁴ Although overinclusive, this category primarily contains data reported by flour mills and is considered representative of the flour milling industry. These data afford the only historical series that report industry operating statistics, materials consumed by kind, and other variables.

Other sources also offer information on the milling industry. The *Milling Directory*, published annually by *Milling and Baking News*, represents the most comprehensive source of information on mill locations and plant capacities. The milling industry regards these numbers as benchmarks.

This report focuses on wholesale baking, the only industry segment for which the census reports an appropriate category (SIC 205, "Bakery Products"). The "Bread, Cake, and Related Products" industry (SIC 2051) contains data for those establishments "primarily engaged in the manufacture of bread, cakes, and other 'perishable' bakery products." It includes establishments making bakery products for sale primarily through one or more nonbaking retail outlets. The "Cookies and Crackers" industry (SIC 2052) comprises establishments primarily engaged in the manufacture of cookies, crackers, pretzels, and similar "dry" bakery products. The census classifies other baked items primarily as "frozen specialties" and "miscellaneous products." Trade sources also publish wholesale baking directories listing plant locations, items produced, employment numbers, and other information (*Milling and Baking News' Baking Directory* and the *Red Book* published by *Bakery Production and Marketing*).

In contrast, little information exists on instore bakeries and retail bake shops, which are particularly fast-growing segments of the baking industry. The 1982 *Census of Retailing* has some data about retail bakeries. The Bureau of Labor Statistics compiles employment and hourly wage data about retail bakeries. The census annual and monthly *Survey of Retail Sales* also provides data about retail baking. Most information concerning instore and retail outlets is compiled from surveys conducted by trade magazines (*Supermarket Business* and *Bakery Production and Marketing*).

Other information sources also focus on milling, baking, and related areas. Some of these publications include the following:

¹⁴ For more information on census classification, see 189.

Advertising Age, Crain Communications, Inc., 740 Rush Street, Chicago, IL 60611.

Fresh Baked, Retail Bakers of America, 6525 Bellcrest Road, Hyattsville, MD 20782.

Prepared Foods, 8750 West Bryn Mawr Avenue, Chicago, IL 60631.

Progressive Grocer, Maclean Hunter Media, Inc., 1351 Washington Street, Stamford, CT 06902.

Vending Times, Vending Times, Inc., 545 8th Avenue, New York, NY 10018.

American Bakers Association, 2020 K Street, NW., Washington, DC 20006, (202) 296-5800.

American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502, (913) 537-4750.

Biscuit and Cracker Manufacturers' Association, 1660 L Street, NW., Washington, DC 20036, (202) 223-3127.

Retail Bakers of America, Presidential Building, Suite 250, 6525 Bellcrest Road, Hyattsville, MD 20782, (301) 277-0990.

Millers' National Federation, Suite 305, 600 Maryland Avenue, SW., Washington, DC 20024, (202) 484-2200.

National Grain and Feed Association, 500 Folger Building, 725 15th Street, NW., Washington, DC 20005, (202) 783-8945.

Trade associations also conduct studies and provide information on industry structure, conduct, and performance. These associations include the following:

Table 69—Selected operating ratios for the bread, cake, and related products industry

Item	Unit of measure	1972	1977	1982	1986
Payroll/employee (current)	Dollars	8,745	13,122	19,037	21,975
Payroll/employee (real) ¹	do.	20,103	19,527	19,037	19,092
Production workers as percent of employment	Percent	57	55	52	53
Annual hours per production worker	Hours	2,001	1,968	1,970	1,952
Average hourly earnings of production workers (current)	Dollars	4.00	6.01	8.68	10.40
Average hourly earnings of production workers (real)	do.	9.20	8.94	8.68	9.04
Materials cost as percent of shipment value	Percent	43	42	40	37
Materials and payroll as percent of shipment value	do.	70	67	65	59
Value added/employee (current)	Dollars	18,181	30,170	46,052	62,490
Value added/employee (real)	do.	41,795	44,896	46,052	54,292
Payroll as percent of value added	Percent	48	43	41	35
Value added per production worker hour (current)	Dollars	16.04	28.01	44.89	59.95
Value added per production worker hour (real)	do.	36.87	41.68	44.89	52.09
New capital expenditure per employee (current)	do.	882	1,575	2,240	2,664
New capital expenditure per employee (real)	do.	2,028	2,344	2,240	2,315

¹ Real values are expressed in 1982 dollars. The value of industry shipments deflator constructed by the U.S. Department of Commerce is used to express current dollars in real dollars.

Sources: (174, pp. 20E-4, 5; 185).

Table 70—Selected operating ratios for the cookie and cracker industry

Item	Unit of measure	1972	1977	1982	1986
Payroll/employee (current)	Dollars	8,197	12,105	17,467	22,667
Payroll/employee (real) ¹	do.	20,647	17,417	17,467	18,842
Production workers as percent of employment	Percent	80	78	77	74
Annual hours per production worker	Hours	1,982	1,971	1,909	2,006
Average hourly earnings of production workers (current)	Dollars	3.74	5.56	8.42	10.38
Average hourly earnings of production workers (real)	do.	9.42	8.00	8.42	8.63
Materials cost as percent of shipment value	Percent	42	43	40	36
Materials and payroll as percent of shipment value	do.	61	61	57	52
Value added/employee (current)	Dollars	24,791	38,719	61,169	88,178
Value added/employee (real)	do.	62,446	55,711	61,169	73,298
Payroll as percent of value added	Percent	33	31	29	26
Value added per production worker hour (current)	Dollars	15.58	25.31	41.76	59.58
Value added per production worker hour (real)	do.	39.24	36.42	41.76	49.53
New capital expenditure per employee (current)	do.	893	1,954	2,364	3,629
New capital expenditure per employee (real)	do.	2,249	2,812	2,364	3,017

¹ Real values are expressed in 1982 dollars. The value of industry shipments deflator constructed by the U.S. Department of Commerce is used to express current dollars in real dollars.

Sources: (174, pp. 20E-4, 5; 185).

Table 71—Costs in the cookie and cracker industry as a share of shipment value, 1982

Employment size	Costs of—		
	Materials	Materials and wages	Materials and payroll
<i>Percent of shipment value</i>			
1-19	43	57	61
20-49	49	60	66
50-99	45	58	66
100-249	45	57	64
250-499	48	60	65
500-999	38	51	54
1,000 or more	37	48	56
All plants	40	52	57

Source: (174, p. 20E-10).

Table 72—Costs in the bread, cake, and related products industry as a share of shipment value, 1982

Employment size	Costs of—		
	Materials	Materials and wages	Materials and payroll
<i>Percent of shipment value</i>			
1-19	41	53	65
20-49	42	57	68
50-99	43	56	67
100-249	43	54	66
250-499	37	49	62
500-999	41	53	68
1,000 or more	34	44	59
All plants	40	52	65

Source: (174, p. 20E-10).

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Appendix table 1—Value of product shipments for three-digit food and kindred products industries, 1986

SIC code	Industry	Value of product shipments	Share of food industry shipments
		<i>Million dollars</i>	<i>Percent</i>
201	Meat products	64,008	22
202	Dairy products	37,990	13
203	Canned, frozen, and preserved fruits, vegetables, and food specialties	33,748	12
204	Grain mill products	31,222	11
205	Bakery products	18,561	6
206	Sugar and confectionery products	17,393	6
207	Fats and oils	15,005	5
208	Beverages	43,423	15
209	Miscellaneous foods, preparations, and kindred products	26,771	10
20	Food and kindred products	288,121	100

Source: (173, pp. 2-5, 7).

Appendix table 2—Active wheat flour- and durum-milling capacities by State, 1987

State	Number of mills	Wheat flour ¹	Durum ²	Total
	<i>Number</i>		<i>Cwt</i>	
Alabama	1	9,000	0	9,000
Arizona	3	9,500	2,500	12,000
California	10	65,700	0	65,700
Colorado	3	19,000	0	19,000
Delaware	2	472	0	472
Florida	3	27,500	0	27,500
Georgia	3	13,100	0	13,100
Hawaii	1	2,200	0	2,200
Illinois	8	65,060	0	65,060
Indiana	5	29,900	0	29,900
Iowa	2	14,750	0	14,750
Kansas	18	104,440	0	104,440
Kentucky	7	4,175	0	4,175
Louisiana	3	11,500	1,400	12,900
Maryland	1	3,000	0	3,000
Massachusetts	1	0	8,840	8,840
Michigan	7	27,200	0	27,200
Minnesota	19	103,610	27,000	130,610
Missouri	11	74,848	11,800 ³	86,648
Montana	3	14,700	0	14,700
Nebraska	7	23,670	6,000	29,670
New Jersey	1	12,000 ⁴	0	12,000
New Mexico	2	1,600 ⁵	0	1,600
New York	14	109,900	5,600	115,500
North Carolina	11	33,110	0	33,110
North Dakota	3	7,000	13,000	20,000
Ohio	13	69,575	6,000	75,575
Oklahoma	4	29,500	0	29,500
Oregon	4	18,000	0	18,000
Pennsylvania	21	40,610	0	40,610
South Carolina	2	1,600	0	1,600
South Dakota	1	3,000	0	3,000
Tennessee	11	45,960	0	45,960
Texas	8	44,060	0	44,060
Utah	10	35,100	900	36,000
Virginia	10	17,596	0	17,596
Washington	5	28,800	0	28,800
Wisconsin	1	0	13,500	13,500
Total	239	1,120,736	96,540	1,217,276

¹ Includes capacity that alternates between wheat flour and durum.

² Alternating wheat flour and durum capacity exists in CA (4,800 cwt); OR (6,000 cwt); and UT (7,200 cwt).

³ Includes a 5,000-cwt durum semolina mill under construction in 1987.

⁴ Includes a 12,000-cwt wheat flour mill under construction in 1987.

⁵ Includes a 1,000-cwt wheat flour mill under construction in 1987.

Source: (132, p. 9).

Appendix table 3—Active wheat flour-milling capacity by State, 1987¹

State	Number of mills	Hard wheat	Soft wheat	Whole wheat	Total wheat flour
	<i>Number</i>	<i>Cwt</i>			
Alabama	1	9,000	0	0	9,000
Arizona	3	9,500	0	0	9,500
California	10	54,900	8,300	2,500	65,700
Colorado	3	19,000	0	0	19,000
Delaware	2	472	0	0	472
Florida	3	27,500	0	0	27,500
Georgia	3	7,600	5,000	500	13,100
Hawaii	1	2,200	0	0	2,200
Illinois	8	29,000	34,200	1,860	65,060
Indiana	5	21,500	8,400	0	29,900
Iowa	2	14,250	0	500	14,750
Kansas	18	97,470	6,160	810	104,440
Kentucky	7	0	4,150	25	4,175
Louisiana	3	11,500	0	0	11,500
Maryland	1	0	3,000	0	3,000
Michigan	7	0	25,300	1,900	27,200
Minnesota	19	96,750	60	6,800	103,610
Missouri	11	61,348	13,500	0	74,848
Montana	3	13,800	0	900	14,700
Nebraska	7	23,670	0	0	23,670
New Jersey	1	10,000	0	2,000	12,000 ²
New Mexico	2	1,600	0	0	1,600 ³
New York	14	103,900	3,000	3,000	109,900
North Carolina	11	20,326	12,784	0	33,110
North Dakota	3	7,000	0	0	7,000
Ohio	13	11,900	56,675	1,000	69,575
Oklahoma	4	29,500	0	0	29,500
Oregon	4	17,500	0	500	18,000
Pennsylvania	21	16,500	22,610	1,500	40,610
South Carolina	2	600	1,000	0	1,600
South Dakota	1	3,000	0	0	3,000
Tennessee	11	22,500	22,960	500	45,960
Texas	8	42,920	140	1,000	44,060
Utah	10	29,200	5,810	90	35,100
Virginia	10	11,700	5,382	514	17,596
Washington	5	16,000	9,500	3,300	28,800
Total	237	843,606	247,931	29,199	1,120,736

¹ Capacity alternates among wheat flour types in CA, GA, MN, MO, OR, TX, UT, and VA.

² Includes a 12,000-cwt mill under construction in 1987.

³ Includes a 1,000-cwt mill under construction in 1987.

Source: (I32, p. 9).

Appendix table 4—Grain product consumption

Year	Wheat flour	Rye flour	Rice	Corn flour and meal	Oat cereals	Barley products
<i>Pounds per person</i>						
1966	111.9	1.5	7.2	7.5	3.3	1.1
1967	113.0	1.5	7.4	7.7	3.2	1.3
1968	112.8	1.6	7.8	7.4	3.2	1.3
1969	112.5	1.5	8.2	7.5	3.2	1.2
1970	110.8	1.5	6.7	7.0	3.2	1.2
1971	110.5	1.4	7.6	6.7	3.2	1.2
1972	109.8	1.3	7.0	6.2	3.2	1.2
1973	112.8	1.6	6.9	5.9	3.3	1.2
1974	110.9	1.5	7.5	5.8	3.4	1.2
1975	114.5	1.2	7.6	6.0	3.5	1.2
1976	119.1	1.0	7.1	5.8	3.6	1.2
1977	115.5	.9	7.5	5.7	3.7	1.1
1978	115.2	.9	5.7	5.9	3.8	1.1
1979	117.2	.9	9.4	6.2	3.8	1.1
1980	116.8	.9	9.4	6.3	3.9	1.0
1981	115.8	.8	11.0	6.2	4.0	1.0
1982	116.7	.8	11.8	6.6	4.0	.9
1983	117.4	.8	9.7	6.6	4.1	.9
1984	118.1	.8	8.6	6.6	4.3	.9
1985	123.3	.8	9.1	6.7	4.4	.9
1986	123.6	.8	11.6	6.7	4.5	.9
1987	128.0	.8	13.4	6.7	4.6	.9

Source: (118).

Appendix table 5—Daily flour milling capacities owned by companies with at least 10,000 cwt of daily capacity¹

Company	1973	1978	1983	1987
			<i>1,000 cwt</i>	
ConAgra, Inc.	88.3	93.0	190.9	166.0
ADM Milling Co.	67.5	84.0	107.0 ²	162.7
Cargill, Inc.	9.0	46.0	128.0	139.7
The Pillsbury Co.	94.7	111.6	121.4	119.7 ²
Seaboard Allied Milling Corp.	62.3	86.0	(Cargill)	(Cargill)
International Multifoods, Inc.	57.7	57.9	61.4	66.7 ³
Dixie-Portland Flour Mills	33.0	47.0	51.0	55.0
Peavey Co.	40.1	75.4	(ConAgra)	(ConAgra)
General Mills, Inc.	55.1	55.1	55.1	62.3
RJR Nabisco	40.0	44.5	43.0	28.0 ⁴
Ross Industries	33.0	(Cargill)	(Cargill)	(Cargill)
Cereal Food Processors, Inc.	17.0	21.9	31.3	68.3
Bay State Milling Co.	29.7	34.9	34.0	53.3
Colorado Milling & Elevator Co.	29.2	(Peavey)	(ConAgra)	(ConAgra)
Mennel Milling Co.	15.0	17.0	21.0	21.0
Fisher Mills, Inc.	15.0	15.0	15.0	15.0
Bartlett Agri-Enterprises	—	14.0	15.0	13.0
Tennant & Hoyt Co.	⁵	10.0	11.0	(Pillsbury)
Centennial Mills	19.0	24.0 ²	(ADM)	(ADM)
Standard Milling Co.	14.5	16.3	(Uhlmann)	(ConAgra)
Sunshine Biscuits	12.2	⁵	⁵	(ConAgra)
The North Dakota Mill	5.0	5.0	7.0	7.0
Acme-Evans	⁵	⁵	10.0	12.0 ⁶

— = Not in existence.

¹ Acquiring milling companies are in parentheses.

² Includes alternating durum capacity.

³ Acquired by ConAgra in 1988.

⁴ All but 1 mill acquired by ADM.

⁵ Less than 10,000 cwt daily capacity (company total).

⁶ Acquired by ADM in 1988.

Sources: *I32*, pp. 10, 22-40; *I33*, pp. 8, 26-42; *I34*, pp. 12, 27-49; *I37*, pp. 14, 19-84).

Appendix table 6—Daily durum milling capacities owned by companies with at least 10,000 cwt of daily capacity¹

Company	1973	1978	1983	1987
<i>1,000 cwt</i>				
ConAgra, Inc.	0	0	25.6	25.5
ADM Milling Co.	12.0	12.0	16.0 ²	5.0
Cargill, Inc.	—	0	6.0	1.4
The Pillsbury Co.	0	0	0	12.0 ²
Seaboard Allied Milling Corp.	0	5.0	(Cargill)	(Cargill)
International Multifoods, Inc.	14.0	14.0	16.7	13.6 ³
Dixie-Portland Flour Mills	0	0	0	0
Peavey Co.	19.0	23.1	(ConAgra)	(ConAgra)
General Mills, Inc.	0	0	0	0
RJR Nabisco	0	0	0	0
Ross Industries	0	(Cargill)	(Cargill)	(Cargill)
Cereal Food Processors, Inc.	0	0	0	0
Bay State Milling Co.	0	0	0	2.5
Colorado Milling & Elevator Co.	0	(Peavey)	(ConAgra)	(ConAgra)
Mennel Milling Co.	0	0	0	0
Fisher Mills	0	0	0	0
Bartlett Agri-Enterprises	—	0	0	0
Tennant & Hoyt Co.	4	0	0	(Pillsbury)
Centennial Mills	0	0	(ADM)	(ADM)
Standard Milling Co.	0	0	(Uhlmann)	(ConAgra)
Sunshine Biscuits	0	4	4	(ConAgra)
The North Dakota Mill	5.0	5.0	11.0	11.0
Acme-Evans	4	4	0	0

— = Not in existence.

¹ Acquiring milling companies are in parentheses.

² Nonalternating durum capacity only. Alternating durum capacity is included in capacities shown in appendix table 5.

³ Acquired by ConAgra in 1988.

⁴ Less than 10,000 cwt daily capacity (company total).

Sources: *I32*, pp. 10, 60; *I33*, pp. 8, 60; *I34*, pp. 12, 69; *I37*, pp. 14, 99-100).

Appendix table 7—Concentration of milling capacity among wheat flour mills

Size grouping	1973	1978	1983	1987
<i>Cwt of capacity</i>				
4 largest	312,750	374,600	547,300	588,100
8 largest	505,650	610,000	757,800	840,350
12 largest	630,500	759,400	872,800	957,600
All firms	929,107	1,026,960	1,091,806	1,120,736
<i>Percent share of market</i>				
4 largest	33.7	36.5	50.1	52.5
8 largest	54.4	59.4	69.4	75.0
12 largest	67.9	73.9	79.9	85.4
All firms	100.0	100.0	100.0	100.0

Sources: (I32, pp. 11, 60; I33, pp. 9, 60; I34, pp. 14, 69; I37, pp. 16, 99–100).

Glossary

Acquisition—the legal transformation through which a company gains ownership and control of another company.

Air classification—milling process in which swirling air funnels larger particles away from smaller, high-protein “fines;” results in the separation of low- and high-protein fractions.

Bake-off format—a production process in which 95 percent or more of the bakery’s output is made from frozen dough that is either purchased or made in the bakery’s own plant.

Blending—the process of combining lots of wheat from different bins into a uniform blend.

Bran—the coarse outer covering of the wheat kernel that is separated from the wheat endosperm during the milling process.

Break flour—flour produced by the break rolls as the wheat passes through the break system of the milling process (see break system).

Break system—refers to the series of rotating corrugated rollers that separate the endosperm from the bran in the milling process.

Captive bakery—a bakery owned by a supermarket chain.

Clear flour—that portion of flour remaining after the “patent” cut of flour has been taken off; clear flour is normally higher in ash and protein than patent flour and of lower market value.

Combination bakery—a bakery that uses more than one form of production or supply (that is, a bakery that uses both bake-off and scratch/mix production).

CCC commercial credit—refers to short- and intermediate-term commercial credit guarantee programs operated by the Commodity Credit Corporation (CCC); GSM-102 guarantees repayment of private, short-term credit (up to 3 years); GSM-103 is an intermediate-term program that covers credit extended for 3-10 years.

Concentration ratio—the market share held by the top-ranked firms in an industry; may be measured by sales, productive capacity, or other criteria; often examined as a 4-firm, 8-firm, or 12-firm grouping.

Conduct—describes firm-level strategies in pricing, advertising, research and innovation, and plant investment.

Cooperative—an organization that performs services (research and development, advertising) for members at a lower cost than if members independently performed those same services.

Diversification—a company’s undertaking of activities outside its primary product line or service.

Durum wheat—*Triticum durum*; spring seeded; very hard; a high-protein wheat used in the production of pasta products (macaroni, spaghetti, and other noodles).

Economies of scale—advantages that permit large producers to manufacture and market their products at lower average cost per unit than small producers can; includes product-specific economies (associated with the volume of any single product made and sold), plant-specific economies (associated with the total output of an entire plant or plant complex), and multiplant economies (associated with an individual firm’s operation of multiple plants).

Efficient production—the least-cost manufacture of goods.

Endosperm—the starchy portion of the wheat grain that is ground into flour.

Export Enhancement Program—mechanism under which the Commodity Credit Corporation awards bonuses in the form of certificates (redeemable for CCC-owned commodities) to exporters enabling them to sell specified commodities to specified countries at prices below those of the U.S. market.

Extraction rate—the fraction of the wheat kernel that is converted into flour during the milling process.

Family flour—all-purpose flour used for baking breads, cakes, biscuits, and pastries; typically packaged in 5-lb. bags for super-market sale.

Fancy patent flour—the finest grind of all flour fractions; a high-quality flour.

Farina—very pure wheat endosperm that is about the granulation of medium-screen sizings.

First clear—the flour portion that remains after the patent flour has been removed; higher in protein and ash content than patent flour, but poorer in color and with a lower commercial value; may be further divided into fancy clear and second clear.

Flour—soft, finely ground endosperm and meal; consists mainly of the starch and gluten of the endosperm.

Front of the mill particles—Wheat particles removed near the beginning of the milling process that are not finely ground. These particles are larger than “tail of the mill” particles. (See *tail of the mill*.)

Gluten—the rubberlike proteinaceous material remaining after water solubles and starch are washed out of dough; the quantity of gluten in flour is a measure of flour quality; one-third of the weight of wet gluten approximates the protein content of the flour.

Hard red spring wheat—*Triticum aestivum*; spring seeded; may be either dark northern, northern, or red; high in protein; may have either a hard or soft, vitreous endosperm; used primarily to produce bread flour; produced in the upper Great Plains.

Hard red winter wheat—*Triticum aestivum*; fall seeded; may be either dark hard, hard, or yellow hard; medium to high in protein; may have either a hard or soft, vitreous endosperm; used primarily to produce bread flour; produced in the lower Great Plains.

Hard wheat—a generic term applied to wheat with a vitreous endosperm suitable for making bread flour or semolina; yields coarse, gritty flour that is free-flowing and easily sifted; flour consists primarily of regularly shaped particles of whole endosperm.

Hedging—a method of shifting price risks, most commonly accomplished by simultaneously trading in the cash and futures market; consists of making an equal but opposite trade in futures so that the cash transaction is protected; typically assumes that cash and futures prices will move in the same direction and maintain similar relationships.

Horizontal integration—ownership and control of more than one company engaged in the production of the same primary product line.

Instore bakery—a supermarket operating unit that offers fresh-baked goods and emphasizes personalized service, convenience, quality, and variety.

Integration—ownership or control of identical or successive stages in the production process (see *vertical* and *horizontal integration*).

Marketing margin (or marketing spread)—the difference between prices at different levels in the marketing channel; often refers to the difference between the price paid by consumers and that obtained by producers.

Merger—the legal transformation through which two or more formerly independent firms come under common control.

Middlings—fine particles of bran and the wheat kernel; normally used for livestock feed.

Middlings rolls—a pair of smooth rolls used in the milling process to reduce middlings to flour-particle size.

Mill byproduct—a secondary milling product obtained in addition to the principal product; refers to millfeed (particularly bran and middlings).

Pasta—a general term referring to products made principally from durum wheat (macaroni, spaghetti, and noodles).

Patent flour—that “cut” of flour from the front of the mill; low in ash and protein; highest in value of all grades of flour.

Performance—describes such industry- or firm-level attributes as profitability, capacity use, efficiency, and equity.

Prepared flour mixes—flour blends that are tailored for the production of specific items; examples are biscuit, cake, doughnut, and pancake mixes.

Product stream—any one of 125 to 150 mill streams in the flour manufacturing process.

Protein—any of a large class of naturally occurring complex combinations of amino acids; in wheat, protein is important in determining baking and nutritional qualities.

Protein premium—the amount of money per bushel that a high-protein wheat normally commands over wheat of the same grade specification with lower protein content.

Public Law 480 (P.L. 480)—mechanism for distributing food aid to developing countries; developed to expand U.S. agricultural exports, combat hunger, and promote U.S. foreign policy; Title I provides long-term, concessional credit at low interest rates, Title II is a donations program in which U.S. commodities are distributed through private voluntary organizations, and Title III is the Food for Development program.

Reciprocal baking—an arrangement in which production capacity is scheduled so that a company’s plants within a region specialize in the production of different bakery products; these plants then ship items through regional centers for final assembly, distribution, and sale to consumers.

Scratch-mix format—production process in which 95 percent or more of the bakery’s output is made from scratch or from a commercial mix at the store level.

Second clear flour—the lower grade portion of “clear flour”; has a higher ash content and poorer color than first clear flour.

Semolina—a coarse separation of endosperm extracted from durum wheat used to make pasta.

Shorts—an inseparable mixture of bran, endosperm, and wheat germ that remains after milling is completed; used as livestock feed.

Soft red winter wheat—Triticum aestivum; fall seeded; low to medium in protein content with a soft endosperm; used primarily in the production of cakes and other pastries.

Soft wheat—a general term describing wheat with a chalky endosperm suitable for making pastry flour; yields a very fine flour consisting of irregularly shaped fragments of endosperm cells that adhere and sift with difficulty.

Specialty flours—refers to a wide range of flours other than white bread flour; includes rye, pumpernickel, and whole wheat.

Spring wheat—a general term for wheat that is grown in the spring and harvested in the summer or fall; relatively high protein content; used in bread flours.

Straight flour—all of the flour extracted from a given blend of wheat without division or addition of flour from other runs.

Structure—industry features including the number of buyers and sellers, product differentiation among firms, barriers to entry, costs, and the degree of integration and diversification.

Tail of the mill particles—Wheat particles that are removed near the end of the milling process and that have passed through progressively smaller sieve sizes. These particles are smaller than those removed from the front of the mill. (See *front of the mill*.)

Vertical integration—ownership and control of successive stages of the marketing process (for example, a milling company that owns bakeries or an elevator company that owns mills).

Vitreous—a wheat kernel characteristic in which the endosperm is flinty or glassy; vitreous kernels are very hard and appear translucent and bright in strong light.

White pan bread—a commercially baked loaf of white bread.

White wheat—*Triticum aestivum* or *Triticum compactum*, a club wheat; fall or spring seeded; soft or hard; low in protein; used mainly for pastry flours and oriental noodles.

Winter wheat—a general category describing wheats that are sown in the fall, lie dormant in the winter, and are harvested the following spring or summer.

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